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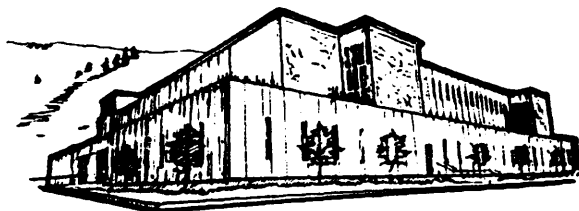
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Author's Signature Rina Ghose

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REGIONALIZING THE CENTRAL BUSINESS DISTRICT
BY STUDYING LAND USE INTENSITIES

by

Rina Ghose

B.A., University of Calcutta, 1988

Presented in partial fulfillment of the requirements

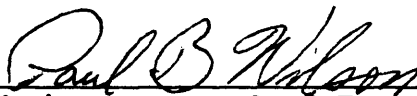
for the degree of

Masters of Arts

University of Montana

1993

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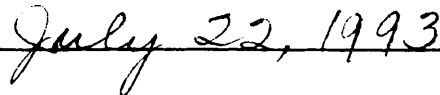


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Ghose, Rina, M.A., July 1993

Geography

Regionalizing the Central Business District by Studying
Land Use Intensities

Director: Paul B. Wilson



The objective of the thesis was to design and implement a methodology for mapping and analyzing land use intensities within the central business district (CBD) of small to medium-sized cities. An additional objective was to regionalize the CBD in terms of its land uses. The downtown of Missoula, Montana, was selected as the site of the case study.

The methodology involved several integral steps. The first step consisted of the delimitation of the CBD which was done according to the Murphy and Vance technique. The next step involved recording the land uses of each floor of each building within the CBD through a land use survey. The data were classified into thirty groups and assigned numerical values following the classifications used in The Standard Land Use Coding Manual. Maps of land uses within buildings were compiled floor-by-floor, and these maps were digitized into the computer. The next objective was the calculation of the area of each land use with the ultimate objective of calculating location quotients. For this, it was necessary to superimpose a sampling grid over the study area. This led to the calculation of location quotient of each land use activity for each grid cell. The location quotients were used to draw isopleth lines showing intensities of land use within the CBD. The resultant isopleth maps provided detailed information on the concentration of different land use activities in the CBD. Regionalization of the CBD was done as the last step. The regionalization was based on standard deviation values of the location quotients. Seven major land use regions were identified over the CBD, which were studied and analyzed.

Acknowledgements

First and foremost, I would like to thank my parents, Gourishankar and Ela Ghose, for their continual support and encouragement.

My heartfelt thanks to my advisor and committee chair, Professor Paul Wilson, for his valuable guidance and advice. In addition, thanks go out to my other committee members, Professors Evan Denney and Paul Miller, for their encouragement.

I would like to thank Professor Douglas Purl and Sara Jane Wilson for their editorial skills.

My thanks to all of my friends at the department, especially Keith Blount and Erik Benson, for giving me company during those long and tedious surveys of the downtown, and Nancy Ebel, for her help and concern.

Lastly, I would like to thank Scott Purl, for his computer aid and optimism.

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CHAPTER I

INTRODUCTION

Urban Geography can be defined simply as the study of urban places. It is "concerned with urbanism, the phenomenon, and with urbanization, the process."¹ Urban Geography is seen as a relatively new science, having gained prominence after the World War II. Although cities existed at least 5000 years ago, major urbanization has been a more recent event. Industrialization has been the chief agent of urbanization, causing it to play a significant role in social, economic, financial and political activities. Generally, cities and towns are classified as urban places, the major criteria being that they have no agricultural land use and that they include a large number of political, economic and social institutions. According to Murphy, urban geographers are interested in studying the city or cities as entities, with respect to their location, character, and growth and their relation to the countryside. Urban geography also involves the study of a city's interior patterns, such as land use patterns, social and cultural patterns, circulation patterns and natural environmental patterns. The interaction and interrelation of these different patterns in an urban area are of deep interest to

¹ Raymond E. Murphy, The American City: An Urban Geography, 2nd ed., (New York: McGraw Hill Book Company, 1974), 3.

urban geographers. Land use patterns present considerable information to urban geographers or planners about the internal structure of a city. Some of the categories of land use are commercial, industrial and residential.

One highly important and often controversial area of cities is the central business district. The center of a city or a town, which has the highest concentration of commercial activities, is formally designated the "Central Business District," or CBD. The CBD is marked by highly concentrated retail and commercial activities along with significant service and public administration employment. Other characteristics, such as a high degree of accessibility and low residential land use, are also observed in the CBD.² Traditionally, the city grows around the CBD, and therefore this district usually constitutes the oldest part of the city. To an urban geographer, the study of the CBD can be a challenging prospect for it is often the most dynamic, volatile part of a city.

Several geographers have studied the nature and characteristics of the CBD and have examined the different types of activities found there. As yet, however, a method has not been developed to study the regional concentration of different activities in the CBD.³

² Truman A. Hartshorn, Interpreting The City - An Urban Geography, 2nd ed., (New York: John Wiley and Sons, 1980), 2.

³ Numerous books have been consulted in an effort to find existing methods, but the search has been unsuccessful so far.

In this thesis, a method is proposed which enables mapping and analyzing the land use intensities of CBD of a small- to medium-sized city as well as regionalizing it. The CBD of Missoula has been used as the case in point of this study, a choice that ensures that the data used are current. Such a method offers numerous benefits to urban geographers in their study of other cities.

Problem Statement. The proposed problem is to design a methodology for mapping and analyzing land use intensities, within the CBD of small- to medium-sized cities. An additional objective is to regionalize the CBD based on the principal land uses found within the CBD.

The Scope of the Study. It is hoped that this study will produce an effective methodology which can be employed by urban geographers to study the regions of land use of the CBD of comparably sized cities. Following the procedures established in this study, research might also be applied to larger cities.

Apart from producing a methodology, this study also offers a more complete knowledge of different regional activities of downtown Missoula based on land use. This information should provide helpful information to Missoula city planners and to the Missoula business community, as well as to urban geographers.

Methodology. The traditional nature and functions of a CBD had to be understood at an early stage in this study. Library research to accomplish this purpose was an obvious task. The study also involved conducting field surveys. Land use surveys were carried out in the fall of 1991. These surveys were performed twice, first to delimit the CBD, then to establish actual land use block by block. A single and separate land use was chosen as the operational taxonomic unit for this purpose. Area of each land use was employed to establish individual location quotient values. Isopleth maps were produced displaying intensities of land use over the CBD. Standard deviation values of the location quotients were used in order to regionalize the CBD into principal land use regions. A more complete discussion of this methodology appears in the next chapter.

CHAPTER II

METHODOLOGY

Introduction. The thesis required the execution of several integral steps to complete the methodology. The first step required the delimitation of the study area. The second step involved the floor-by-floor land use survey of the CBD. The third step consisted of digital mapping of land use activities and calculation of the area for each land use activity. The fourth step required calculation of location quotients of each land-use activity and the drawing of isopleth lines to show the concentration of the land uses in the CBD. The final step consisted of the identification of major regions of land use in the CBD.

Delimitation of CBD: A Review of the Techniques. The Central Business District (CBD) of Missoula city was chosen as the study area for this thesis project. Land use activities of CBD's include retail, service and public administration employment. As a rule, the CBD shows low residential land use. The CBD is usually well-connected with the rest of the city by different means of transportation and is thus highly accessible.⁴ The prominent characteristics of a CBD usually make it an easily identifiable region in any city. However, the precise

⁴ Hartshorn, Interpreting the City, 325.

definition of its boundary has remained a difficult task. Because this study required a clear definition of the boundary of the CBD of Missoula, the first task of the researcher was to find a suitable method which could be applied to identify the boundary. Several methods were reviewed and the Central Business Index Method developed by Murphy and Vance was deemed most suitable and effective.⁵ There are several reasons for this choice, but they are more easily understood if some aspects of the Murphy and Vance technique are reviewed first.

The Basics of Murphy-Vance Technique. The Murphy and Vance technique requires some explanation; a generalized description is given below. The technique involves detailed land use mapping of the CBD. Lot maps of the CBD are generally utilized as base maps. Both vertical and horizontal extent of land uses are mapped by creating (1) ground floor maps of each block and (2) profile maps to

⁵ Delimitation of CBD has been approached in different ways. W. William-Olsson used a shop rent index to identify the CBD of Stockholm. Malcolm J. Proudfoot utilized block-frontage-volume-of-sales to delimit the CBD. Both of these techniques were found to be unsuitable. Other approaches include consideration of building heights, population distribution, traffic and pedestrian flows and valuation data. These did not lead to any satisfactory delimitation technique. The Census of Business data was a much more promising source of delimitation, but was rejected in the end as in 1991, that year's current data had not yet been published. Lastly, the CBD zone delimited by the Office of Community Development of Missoula was considered. It was perceived as being overly large and was not considered to be suitable. Ultimately, the Murphy-Vance technique for delimiting the CBD was perceived to be the most suitable one and was used for the study.

account for the vertical dimension of each side of every block. Central business land uses and non-central business land uses for each lot are recorded. The objective is to calculate two indices, a Central Business Height Index (CBHI) and a Central Business Intensity Index (CBII). The CBHI is defined as

the number of floors of central business uses if these are thought of as spread evenly over the block. It is obtained by dividing the total floor area of all central business uses by the total ground floor area of the block. (CBHI = central business space/total ground floor space).⁶

The CBII is defined as

the proportion of all floor space in central business uses. It is the percentage that total floor area of central business uses makes up of the total floor space at all levels. (CBII = [central business space/total floor space] x 100).⁷

More simply, the CBHI of each block is based on a ratio of total ground floor space to total floor area of all Central Business uses. The CBII of each block is calculated as a percentage, by dividing the total floor area of the block devoted to central business uses by the total block floor area.⁸ According to Murphy and Vance, a block must have a CBHI of one or more and a CBII of 50% or more, in order to be considered CBD in character.

⁶ Murphy and Vance, "Delimiting the CBD," Economic Geography, 30 (1954): 208.

⁷ Ibid.

⁸ Hartshorn, Interpreting the City, 333.

Why Murphy and Vance? The reasons the Murphy and Vance method was chosen are varied. Some have to do with the inherent properties of their system; others are concerned with practical considerations relating to the size of the resulting area. The reasons are as follows:

1. This method was the only one which would produce an accurate definition of the downtown since it would be based upon current land use data obtained from field survey. The method was also systematic in approach and could be executed in other towns and cities as well. Moreover, the results from such studies could be compared.
2. Other definitions of the CBD were all found to be unsatisfactory in one regard or another. The census delimitation of the CBD provided a definition using data from the 1980 census, which were clearly out of date. The Peak Land Value Intersection (PLVI)⁹ definition showed where the location of the heart of the CBD would be, but it did not provide peripheral boundaries. The Core-Frame concept of CBD produced a theoretical understanding of the downtown instead of a

⁹ PLVI refers to the Peak Land Value Intersection or the point where land values and uses are perceived to be the highest in the CBD. According to Truman Hartshorn, "its primacy is the result of its unparalleled accessibility."

practical definition of the boundaries of the CBD.¹⁰

3. The local planning offices were also consulted in order to obtain a systematic definition of the Central Business District of Missoula. Although they had an area in downtown zoned as CBD, it was not considered to be a suitable CBD boundary for the purposes of the study. The CBD zoning included blocks with predominantly residential land use and was thought to be overly large for the study.

Execution of the Murphy-Vance method in the Missoula downtown involved several steps. First, a base map of the downtown Missoula, displaying block outlines at the scale of 1:1200 (1" represents 100'), was obtained from the Office of Community Development of Missoula. The next step, in accordance with Murphy and Vance, was mapping the actual land uses of the downtown. Since the exact boundaries were not known, the researcher started mapping from the PLVI and proceeded toward the outer periphery of the CBD of Missoula.¹¹ This was done because the PLVI is considered

¹⁰ In Truman Hartshorn's opinion, "the core of the CBD is the most intensively used part, while the frame is a surrounding support area."

¹¹ A previous study of the CBD concerning land values and pedestrian traffic flow had been conducted by John J. Filchak, Steven P. Hartmann and Phillip C. Thomas, students of the Department of Geography at the University of Montana. The study showed the PLVI location and CBD land value zones, ranging from highest to lowest. According to the study, the PLVI in the Missoula CBD lies at the intersection of Main and Higgins. Both land values and pedestrian traffic volume in the CBD were found to be highest here.

to be the "heart of the CBD." In addition,

Land values and uses are often hypothesized to be the most intense for frontages at this location, which can be thought of as the heart of the CBD. Its primacy is the result of its unparalleled accessibility.¹²

Delimitation of the Missoula CBD. During the delimitation process, several objectives were kept in mind. The first rule was to recognize that this technique makes a distinction between typical central business land use and non-typical use. After thorough study, Murphy and Vance came to the conclusion that

the really essential central business functions appeared to be the retailing of goods and services for a profit and the performing of various office functions.¹³

Murphy and Vance considered non-central business functions to be those whose locations in the CBD are not based on a profit motive. Several land uses were considered non-central business in character:

1. Permanent residences (including apartment houses and rooming houses);
2. Governmental and public facilities (including parks and public schools as well as establishments carrying out city, county, state, and federal governmental functions);
3. Organizational establishments (churches, fraternal orders, colleges, etc.);
4. Industrial establishments (except

¹² Hartshorn, Interpreting the City, 333.

¹³ Murphy and Vance, Delimiting the CBD, 203.

- newspapers);
- 5. Wholesaling;
- 6. Vacant buildings or stores;
- 7. Vacant lots;
- 8. Commercial storage.¹⁴

Other principles that were followed by the researcher are discussed below:

1. Following the above criteria, land uses were to be classified as Commercial (C) or Non-Commercial (X) for purposes of land use mapping. Commercial land uses are inferred from typical central business land uses whose location in the CBD has been motivated by profit. Non-Commercial land uses are those whose location in the CBD is not profit motivated, and which in essence do not represent the typical character of the CBD. In addition to the Murphy-Vance list, certain other definitions of C and X land uses were developed by the researcher to handle the special circumstances presented by Missoula.
 - (a) Lawyer's offices, including those of Public Defenders, were considered as commercial land use.
 - (b) Hospitals, clinics, family-planning units were regarded as commercial land uses.
 - (c) Ground sites that were vacant, under construction, or for rent were considered non-commercial land uses.

¹⁴ Ibid, 219.

- (d) Parking lots were considered as commercial land use.
 - (e) Basements were excluded from the survey.
2. In plotting land use, care was taken to show the extent of horizontal as well as vertical spread over each block. To this end, two methods were employed.
- (a) Ground floor mapping--Each of the blocks was traced from the base map onto a tablet-sized sheet, one block to each sheet. The street names were supplied on each side of the block. These individual block maps were then attached to a clipboard. While in the field, the researcher faced the front of a block and marked off C and X areas of the ground floor on the map. Where necessary, measurements were made by pacing the distance along the sidewalks.
 - (b) Profile mapping--In order to consider the vertical dimensions of the block, profiles of the block were drawn. For each block, four profiles were obtained, one for each side. Each profile was drawn from left to right. The researcher would face the block and write the name of the base street on the x axis of the drawing. The street on the left side formed the first y axis (y1), and the street

on the right formed the second y axis (y2).

The C and X areas of each floor were then marked off.

Once each block was surveyed in this manner, the maps were brought back to the laboratory, and each block was traced on inch graph paper divided to tenths of an inch. The inch graph was chosen in order to remain consistent with the scale of the base map, which was 1" represents 100'. After the block outline was traced, the land uses of the ground floor were traced inside the outline.

Next, reproduction of the vertical dimension of the block was addressed. The profile sketches provided information regarding the height of each block. For each floor, one block outline was traced again. The profile sketches also displayed C or X land use information for each floor. For each upper floor block outline, only the part having a land use was traced in and the rest was left as blank or N. Following these steps, each block's land use was mapped. While surveying the land uses, the researcher would traverse each alley to determine extent of land use. However, the extent of each land use, along the front and the back of a block, was estimated by eye, and was subjective to a certain degree.

The next step involved the determination of the CBD boundary. For this, the researcher calculated the floor areas of commercial and non-commercial land uses and the

total floor area, per block, on the graph paper. Then, using the Murphy and Vance technique described earlier in this chapter, the CBHI and the CBII of each block were calculated. Following Murphy and Vance's definitions, a block was considered CBD in character if it had a CBHI of one or more and a CBII of 50% or more. If the block conformed to both the ratios, then it was a likely candidate to be included in the CBD. After all the blocks were subjected to this test, the resultant CBD and non CBD blocks were plotted on a map, using the color red to identify CBD blocks and yellow to distinguish non CBD blocks.

However, satisfying the two indices was not enough to distinguish the CBD boundary. Each block also had to be subjected to certain rules set by Murphy and Vance. These rules are reproduced below:

1. To be considered part of the CBD, a block must be part of a contiguous group surrounding the peak value intersection. Even if a block touches the others at only one corner it is considered contiguous.
2. A block that does not reach the required index values but is surrounded by blocks that do is considered part of the CBD.
3. A block completely occupied by the buildings and the grounds of a city hall or other municipal office building, a municipal auditorium, city police or fire department headquarters, or a central post office is included within the CBD if it is adjacent to blocks meeting the standard requirements. In some cities it will be necessary to add to this list the buildings and grounds of certain other government buildings: the courthouse in a county seat; the state capitol building; and occasionally certain

federal buildings in addition to the post office, e.g., a federal court building or other federal office building the activities of which are closely integrated with those of the city and the region. In no instance should such government buildings as those described in this paragraph result in the extension of the CBD for more than one block beyond normal CBD blocks. Thus where there is a group of state buildings occupying several blocks that border the CBD, as in some state capitals, the whole group is considered non-CBD.

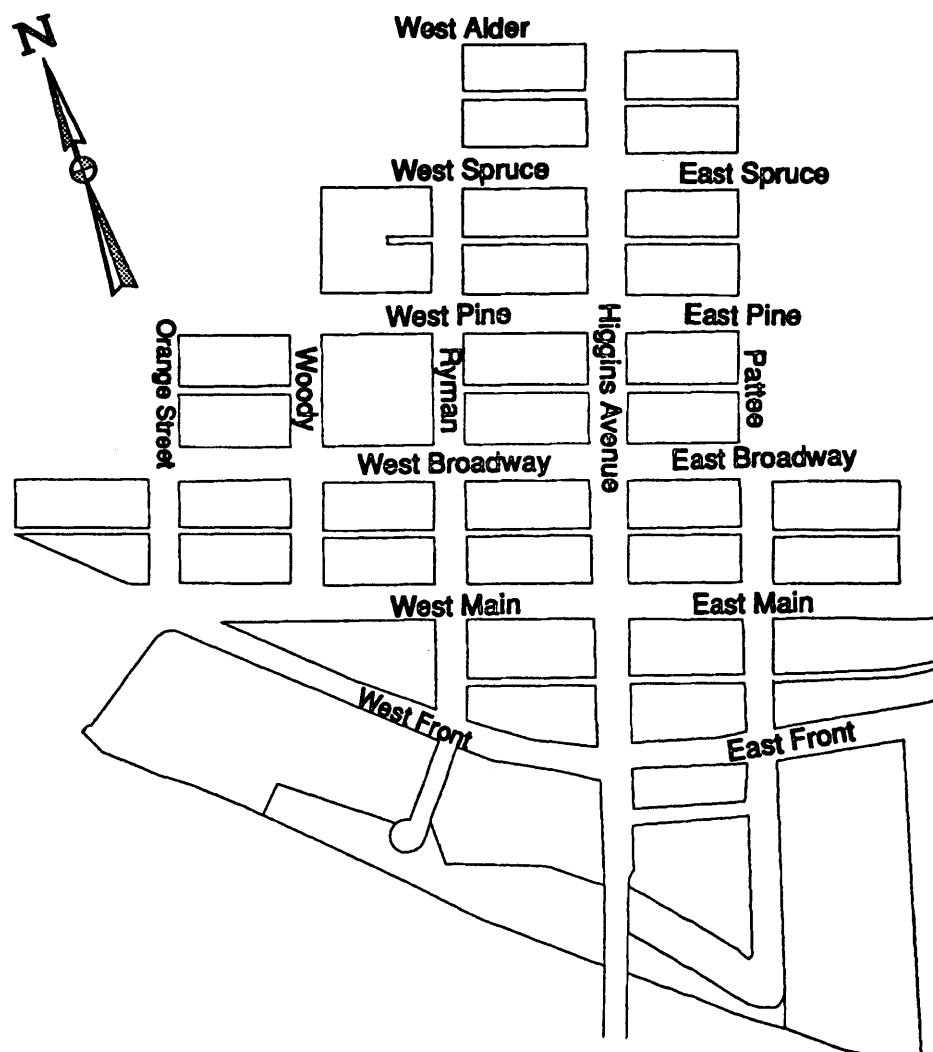
4. If the structures mentioned in Rule 3 occupy only part of a block which is contiguous to other CBD blocks and if the inclusion of these establishments as central business would bring the two indices of the block to the required totals then the block is considered part of the CBD.¹⁵

Following these rules, blocks were designated for inclusion or exclusion in the CBD. Blocks that failed the CBHI and CBII criteria could still be included within the CBD if they conformed to the rules discussed above. The next step was the plotting of the actual demarcation line that would separate the CBD from the rest of the city.

The resultant CBD is smaller than the area zoned as CBD by the Office of Community Development. The CBD of Missoula, as per Murphy and Vance, lies to the north of the Clark Fork river. From north to south, it extends from Alder Street to the river front area. From east to west, its extent varies with each block. An examination of the map shows the extent of the CBD of Missoula (Map 1).

¹⁵ Murphy and Vance, Delimiting the CBD, 219.

CBD of Missoula



0 150 300 600 900
Scale in Feet

Rina Ghose

Map 1

Land Use Survey of the CBD of Missoula. The next step in the research work was to determine specific types of land uses for each block within the CBD. This required a highly specific land use survey of the delimited CBD of Missoula. Once again, current land use data were unavailable, a deficiency that made it necessary for the researcher to carry out a land use survey within the CBD of Missoula. Outlined maps of each block, traced on inch graph paper, were once again taken into the field. The extent of land use of each block was traced and the type of the land use noted. For the upper floors of buildings, the building directory was consulted in order to determine types of land use. In cases of uncertainty, the occupants of a building were queried about the nature of their businesses. To determine the spread of land uses from the front of the block towards the back, the researcher would step inside the alley and estimate. However, this was a subjective process based on visual estimation only. A few problems were encountered while recording the type of land use of upper floors of a block. If the upper floors of a building were vacant or residential and if there was no building directory it was sometimes hard to discover the specific nature of the land use of those floors. In such cases, the researcher would ask the downstairs occupants about the activities conducted on the upper floors. If a definitive response was not forthcoming, the researcher would infer the answer from

the outside appearance of the upper floors. If the windows were soaped over or boarded up, the researcher would assume the floor in question to be vacant. If the windows had curtains, flower pots, etc., and conveyed the appearance of occupancy, the researcher would assume the floor to be residential. In this way, complete floor-by-floor land use maps of each block within the CBD of Missoula were obtained.

The Standard Land Use Coding Manual. The next step was to code these uses according to a standardized land use classification system. For this, the Standard Land Use Coding Manual was consulted.¹⁶ This is a standard system for identifying and coding land use activities established by two federal agencies, the Urban Renewal Administration and the Bureau of Public Roads. The objective of these agencies was to provide a uniform and universally applicable classification and coding system for the land use data collected for various types of studies. For this thesis work, the decision to use this manual was based on two grounds:

1. The manual provided a systematic and universally applicable numeric land use classification system.

¹⁶ Urban Renewal Administration, Housing and Home Finance Agency and Bureau of Public Roads, Department of Commerce, Standard Land Use Coding Manual: A Standard System for Identifying and Coding Land Use Activities (Washington D.C.:Superintendent of Documents, U.S. Government Printing Office, 1965).

2. The researcher was unable to find a better alternative.

A description of the general structure of the coding system is given here to provide a better understanding of the Standard Land Use Coding Manual. The manual considers "activity" to be the single most important land-use characteristic.

Accordingly,

the primary purpose [of the manual] was to establish an extensive system of categories that would identify each land use activity and which could also be numerically coded in order to facilitate data handling on automatic data processing equipment.¹⁷

Based on these objectives, the classification system consists of a list of land use activities divided into certain categories. For coding land use activity, the manual has nine one-digit categories (of which numbers two and three have been assigned to the manufacturing activity, discussed as types A and B respectively in the thesis), 67 two-digit categories, 294 three-digit categories, and 772 four-digit categories. The system is designed so that

the categories at the four-digit level identify land use activity in the greatest detail, and as the system is aggregated to the three-, two-, and one-digit levels the categories become more generalized.¹⁸

Residential land use is cited here to illustrate the Standard Land Use coding system through Tables 1 and 2.

¹⁷ Standard Land Use Coding Manual, 4.

¹⁸ Ibid, 9.

Table 1.--A Standard System For Identifying And Coding Land Use Activities--One- And Two-Digit Levels

Code	Category	Code	Category
1	Residential	11	Household Units
		12	Group Quarters
		13	Residential Hotels
		14	Mobile Home Parks or Courts
		15	Transient Lodgings
		16	Other Residential

Table 2.--A Standard System For Identifying And Coding Land Use Activities--Two-, Three-, And Four-Digit Levels

Code	Category	Code	Category	Code	Category
11	Household Units	110	Household Units	1100	Household Units
12	Group Quarters	121	Rooming and Boarding Houses	1210	Rooming and Boarding Houses
		122	Membership Lodgings	1221	Fraternity and Sorority Houses
				1229	Other Membership Lodgings
		123	Residence Halls or Dormitories	1231	Nurses' Homes
				1232	College Dormitories
				1239	Other Residential Halls or Dormitories
		124	Retirement Homes and Orphanages	1241	Retirement Homes

				1242	Orphanages
				1251	Convents
				1252	Monasteries
				1253	Rectories
				1259	Other Religious Quarters
		129	Other Group Quarters	1290	Other Group Quarters
13	Residential Hotels	130	Residential Hotels	1300	Residential Hotels
14	Mobile Homes Parks or Courts	140	Mobile Homes Parks or Courts	1400	Mobile Homes Parks or Courts
15	Transient Lodgings	151	Hotels, Tourist Courts, and Motels	1510	Hotels, Tourist Courts, and Motels
		159	Other Transient Lodgings	1590	Other Transient Lodgings
19	Other Residential	190	Other Residential	1900	Other Residential

This structure allows the surveyor to select the level of detail most suitable to a given study. For her land use survey, the researcher used up to the three-digit level of each category, a choice which allowed her to identify precisely the various types of land use activities. Thus, with the use of this coding manual and its system, the researcher identified all of the land uses of the CBD.

A disadvantage to this system encountered in the course of coding land use activities is that the manual does not record every contemporary land use and clearly needs

revision and updating. A few times, the researcher was unable to locate the codes of certain land uses, mainly because such land use activities were not commonplace at the time the manual was written. In those instances, the researcher would identify that land use as belonging to the "other" category in the three-digit level. Fortunately, in each of the nine major land use categories, there is one category named "other" in the three-digit level, and any miscellaneous activity which could not be identified by any specific codes could be located there.

Certain rules were followed while coding:

1. In some instances, a land use unit had multiple activities or functions. In such cases, the primary function was identified and coded.
2. For the upper floors, the coding was restricted to two digits. The land use data for the upper floors were usually collected through the building directory, whose listings were sufficiently explicit to assign them up to two digit codes, but not precise enough for the three digit codes.

A complete listing of the land use categories at the one and two digit levels as found in the Standard Land Use Coding manual is given in Table 3.

Digital Mapping of Land Use Activity and Area Calculation.

The next step in the research work involved digital

Table 3. --The Categories and Code Numbers In
The Standard Land Use Coding Manual: One- And Two- Digit Levels

Code	Category	Code	Category
1	Residential	11	Household units
		12	Group quarters
		13	Residential hotels
		14	Mobile home parks or courts
		15	Transient lodgings
		19	Other residential. NEC
2	Manufacturing, Type A	21	Food and kindred products
		22	Textile mill products
		23	Apparel and other finished products made from fabrics, leather, and similar
		24	Lumber and wood products (except
		25	Furniture and fixtures
		26	Paper and allied products
		27	Printing, publishing, and allied industries
		28	Chemicals and allied products
		29	Petroleum refining and related industries
3	Manufacturing, Type B	31	Rubber and miscellaneous plastic
		32	Stone, clay, and glass products
		33	Primary metal industries
		34	Fabricated metal products
		35	Professional, scientific, and controlling instr; photographic and optical goods;
		39	Miscellaneous manufacturing, NEC
4	Transportation, communication, and utilities	41	Railroad, rapid rail transit, and street railway transportation
		42	Motor vehicle transportation
		43	Aircraft transportation
		44	Marine craft transportation
		45	Highway and street right-of-way
		46	Automobile parking
		47	Communication
		48	Utilities
		49	Other transportation, communication, and utilities, NEC
5	Trade	51	Wholesale trade
		52	Retail trade--building materials, hardware, and farm equipment
		53	Retail trade--general merchandise
		54	Retail trade--food
		55	Retail trade--automotive, marine craft, aircraft, and accessories
		56	Retail trade--apparel and accessories
		57	Retail trade--furniture, home furnishings, and equipment

Table 3. --The Categories and Code Numbers In
The Standard Land Use Coding Manual: One- And Two- Digit Levels

		58	Retail trade--eating and drinking
		59	Other retail trade, NEC
6	Services	61	Finance, insurance, and real estate
		62	Personal services
		63	Business services
		64	Repair services
		65	Professional services
		66	Contract construction services
		67	Government services
		68	Educational services
		69	Miscellaneous services
7	Cultural, entertainment, and recreational	71	Cultural activities and nature exhibitions
		72	Public assembly
		73	Amusements
		74	Recreational activities
		75	Resorts and group camps
		76	Parks
		79	Other cultural, entertainment, and recreational, NEC
8	Resource production and extraction	81	Agriculture
		82	Agricultural related activities
		83	Forestry activities and related services
		84	Fishing activities and related services
		85	Mining activities and related services
		89	Other resource production and extraction, NEC
9	Undeveloped land and water areas	91	Undeveloped and unused land area (excluding noncommercial forest development)
		92	Noncommercial forest development
		93	Water areas
		94	Vacant floor area
		95	Under construction
		99	Other undeveloped land and water areas. NEC

mapping of the CBD, including floor-by-floor mapping of the land uses of each block. Several digitizing software utilities were reviewed and Roots was finally chosen.¹⁹ Roots is a versatile, user-friendly digitizing software created by Harvard College. Prior to digitizing, a cartesian coordinate system (scale 1" represents 100') with an arbitrarily assigned false origin was drawn on to the base map. The coordinate system was not oriented to the north; rather it was oriented to align it with streets to make map viewing more convenient. This map was digitized with Roots; the product served as the base map for the study and included all of the CBD blocks and streets. Next, the land use areas of each block were digitized for the first floor, and this served as the first layer of the map. Using the same base map, land use areas were then digitized for every subsequent floor, reaching up to eight floors and producing eight layers of maps. The land use codes were assigned to each land use area as attribute names, and this was done for all eight layers.

The next step involved the calculation of the area of land use for each land use category. This could be achieved in different ways. Counting the concentration of each activity by blocks was one way of achieving it, but one inherent flaw in this method is that not all of the blocks

¹⁹ Roots Program For Map Digitizing, Editing and Verifying Ver. 1.0, created by Jonathan Corson-Rikert, Dennis White, Kelly Chan (Cambridge, MA:Harvard College).

are of similar area, as some are longer or shaped differently than others. Therefore, use of a superimposed grid was perceived to be a better alternative. Accordingly, a grid was superimposed over the study area with the objective of calculating the aerial extent of each land use activity in each grid cell. The ultimate goal would be to calculate location quotient of that activity for each grid cell. It was decided that the grid would be rotated at an angle before being superimposed over the CBD. The reason for this rotation was to minimize the chances of having any grid cell depict only streets as the land use. Had the grid been aligned along the same direction as the Missoula map, an entire row of grid cells might have reported little other than street land use.

The next step was the determination of the grid size. Ideally, the grid should be scaled so that it is neither too large nor too small. A grid with cell sizes too large would show a loss of detail where refinements fall below the resolving threshold. In order to draw isopleth lines showing land use intensity, it is necessary to have a certain number of control points. A grid with overlarge cell sizes would be unable to provide the necessary number of control points and would end up presenting an overly generalized picture. Conversely, a grid with too small a cell size would be incapable of displaying reasonable samples of land use within each cell. After some

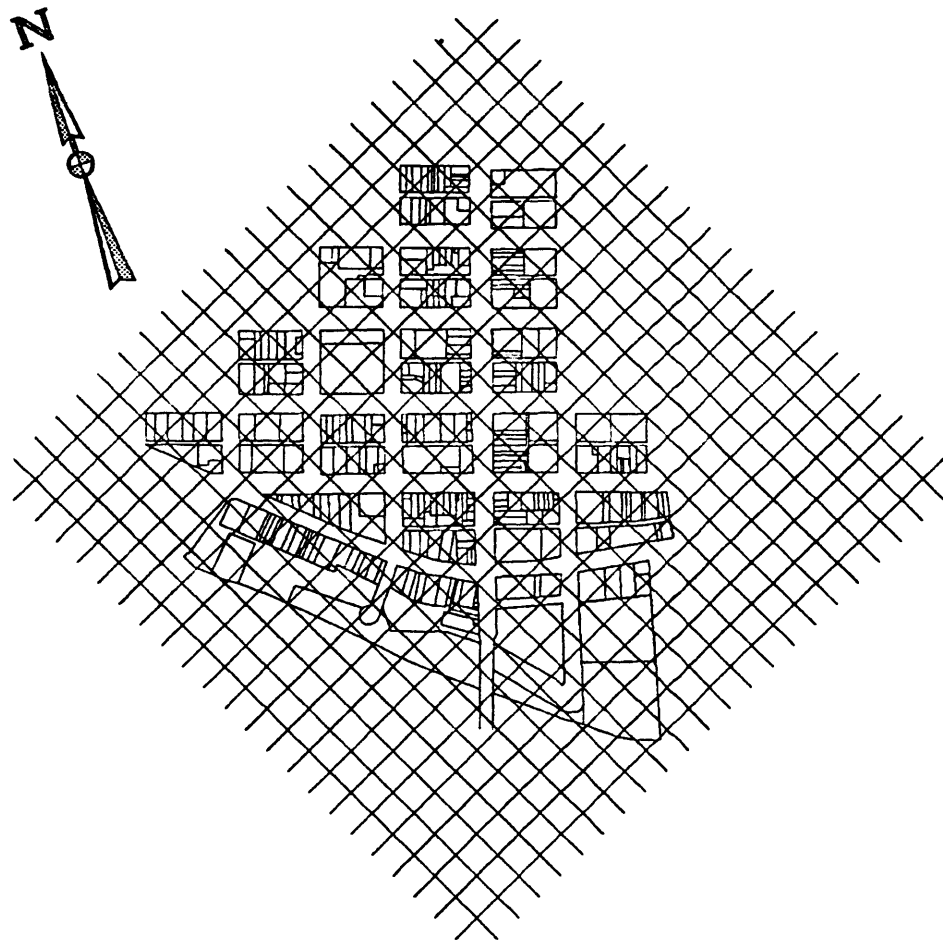
experimentation, it was decided that an index of 1" representing 139' provided the optimum grid scale.

There were several ways the grid could have been produced. It could have been drawn by hand and then digitized or assembled by means of a computer. Construction of the grid through a computer and appropriate software was seen as the easier alternative. The software Roots itself possesses the ability to display grids, drawn according to the user-specified scale. However, Roots does not have the ability to rotate the grid. Nor does the program have the ability to automatically export the grid as a separate layer, a procedure that was needed. For this reason, the software AutoCad was reviewed.²⁰ It was found that AutoCAD could produce the desired grid. Accordingly, the grid was drawn in AutoCAD at the scale of 1" representing 139', and rotated at an angle of 45 degrees. It was then imported to Roots and was registered to the CBD map (Map 2).

Since Roots has a memory limitation that restricts the number of lines and polygons it can handle, all figures were eliminated except the whole grid cells touching any part of the study area. After this step, each grid cell was named and labelled in Roots. Later, for each floor of the CBD, the grid was appended to the CBD map. The append process split each CBD block into polygons in each grid cell. The polygons were all renamed, taking into account the grid cell

²⁰ AutoCAD 386 Release 10 (Sausalito, CA:Autodesk Inc.).

CBD with Sampling Grid



Each grid cell is 139 feet by 139 feet,
or 19,321 square feet.

Rina Ghose

name and the land use code, so that each polygon was uniquely identifiable. Finally, the area of each of these polygons was calculated in square feet. This operation was also done in Roots, which provides the option of calculating the area of polygons in units of measurement defined by the user.

Calculating Location Quotient and Drawing Isopleth Maps.

The next step required the calculation of the location quotient of each land use activity and the drawing of isopleth lines to show the concentration of the land uses in the CBD. The data were imported to the spreadsheet Excel²¹ for the calculation of location quotients (Lq). At this point, it was decided that only the Lq of the thirty major land uses (represented as 2-digit land use in the coding manual) would be shown, since employment of the 3-digit option had produced far too many land uses, resulting in confusing and ineffectual maps. Location quotient or Lq is defined as a co-efficient, comparing some quality of an area with a specified norm.²² The concept is based on the proportion of regional share of a phenomenon to the regional share of area. It measures the degree to which a specific region has more or less than its share of any particular

²¹ Microsoft Excel Ver. 4.0 (Seattle, WA:Microsoft Corporation).

²² The Dictionary of Human Geography, ed. R. J. Johnston et al., 2nd ed., (Oxford: Blackwell Reference, 1986), 265.

activity.

Using the example of an activity of CBD, namely retail trade, the formula for L_q may be calculated in the following way:

$$L_q = \frac{\frac{\text{Area of retail land use in one cell}}{\text{Total land use area in that cell}}}{\frac{\text{Total area of retail land use in the CBD}}{\text{Total land use area of CBD}}}$$

The L_q is then compared to an index value of one. If it is greater than the index value, the area is said to have more than its share of a given activity. If it is less than the index value, it is said to have less than its share of the activity.²³ Thus, an estimate for the share of each activity in each cell of the grid can be obtained.

The L_q was calculated for every grid cell touching Missoula's CBD so that a data set of the L_q values of each activity could be created. Ultimately, these values were attached to map coordinates which represented the center of each grid cell so that isopleth lines could be drawn. The isolines provided the ability to display the concentration of land uses. With the help of these isopleth maps, the CBD could be analyzed in terms of the intensities of its various land uses.

One question that may arise is why isopleth maps showing L_q s were chosen over choropleth maps showing location of different land uses. The answer can be found by

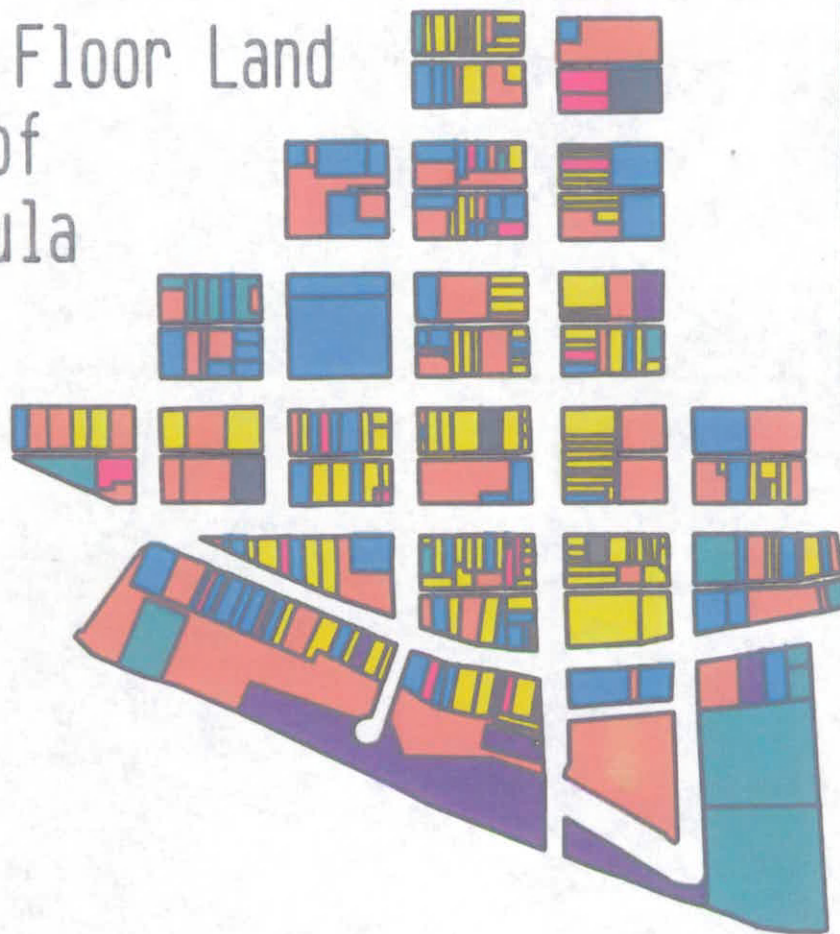
²³ John W. Alexander, Economic Geography, (New Jersey: Prentice Hall, 1963), 406, 407, 594.

viewing a choropleth map. Map 3 shows the location of eight principal land uses found in the first floor of the CBD (Map 3). While this map tells us the location of each of these land uses, it does not provide answers as to how much of each land use is found over these blocks. Visually, little difference can be detected between the blocks involved in a particular land use activity. Yet, each block differs from the other with respect to the amount of land it devotes to a particular land use. Isopleth maps, showing the Lq values of land uses, can depict intensity because Lqs provide information on the share of an activity cell by cell. They tell us how much of a land use activity is found where, and provide a means for analyzing and discerning patterns of land use. Consequently, they were chosen over choropleth maps.

In order to draw isopleth maps, various softwares were reviewed. Surfer, a software package suitable for drawing isopleth maps, was selected.²⁴ The digital map of the CBD was imported into Surfer with the intention of drawing isopleth lines depicting Lq values of land uses of Missoula CBD. Data were entered into Surfer as x, y and z values, in which the x and y represented the x, y coordinate values of the centroid of each grid cell, and the z value consisted of the Lq of each land use of that grid cell. Isopleths were

²⁴ SURFER Access System Ver. 4.08 (Golden, CO:Golden Software Inc.).

First Floor Land Uses of Missoula CBD



Land Use Types

- Residential
- Manufacturing, Type A
- Manufacturing, Type B
- Transportation and Communication
- Retail Trade
- Services
- Cultural, Entertainment, Recreational
- Undeveloped Land Areas

drawn around the centroid of each grid cell. The minimum and maximum Lq values for each land use activity were defined in Surfer. The program interpolated the lines and drew them over the CBD blocks. All together thirty maps were drawn depicting the land use intensity of the thirty major land uses over the Missoula CBD. (See Chapter III.)

Regionalizing the CBD. The final step in the thesis work consisted of the identification of major regions of land use in Missoula downtown. In order to regionalize the CBD, it was necessary to use comparable variables. While the Lq values are suitable for showing the amount of concentration of an activity over an area, they were found to be unsuitable for regionalization, as such values are not comparable. The Lq values of different land use activities varied widely in their ranges. (See Table 4, p.38.) A land use activity like Automobile Parking, which has widespread use over the CBD, would record a maximum Lq of 5.26. On the other hand, Manufacturing of Apparel and Finished Products is an activity found to occur only once and has a maximum Lq value of 226.46. This variation occurs due to the nature of the Lq formula, which caused the land use activities with low numbers of occurrence to have high Lq values and those with high numbers of occurrence to have low Lq values. The Lq values are thus not comparable with each other with regard to their importance. Accordingly, Lq values did not

seem to be a suitable variable for regionalization. However, the Lq data could be used if it were "normalized," i.e. made comparable. Obtaining the standard deviation of these Lq values was seen to be the best way of normalizing data. The purpose was to calculate the number of standard deviation for each land use above or below its mean value. This would lead to the determination of a "leader" land use in each grid cell. The leader land use is perceived to be the one that contained the highest standard deviation above the mean over all other land uses of that grid cell, and consequently, had higher importance than any other land use in that cell.

The next step involved the calculation of the standard deviation of each land use in each grid cell in the spreadsheet. In addition, the mean value of each land use activity was also calculated. Thus, it was simple to deduce what the spread around the mean was for each land use activity. This procedure provided the means for establishing the leading land use activity for each grid cell. Moreover, it provided the basis for regionalizing the CBD.

For the purpose of regionalizing, a broader grouping of land use activities was needed. Missoula CBD data had thus far been collected and analyzed at the second-digit category of the Standard Land Use Coding classification system. This had produced thirty groups of land uses, a number which was

obviously impractical for regionalizing purposes. It was decided that the Lq data would be regrouped and classified into broader groups found at the first-digit level of the classification system. Since the data had been given codes (assigned from the coding manual), this was not a difficult task. An example of how the coding system works is shown by citing the Professional Service category. The code for this activity is 65 and is found at the second-digit level. At the first digit level, this code is six and is found under Service category. (See Table 4.) Thus, it was easy to convert all of the second-digit data into the first-digit level, by taking into account their first digit numbers and assigning the associated category to them. The land uses were thus grouped under the eight major types: Residential, Manufacturing Type A, Manufacturing Type B, Transportation and Communication, Trade, Services, Cultural and Recreational, Undeveloped Land and Water Areas.

The next step was to produce a map which would display the grid overlain on top of the CBD blocks. Mapviewer software was used for this purpose.²⁵ The grid map and the CBD block map were exported from Roots to Mapviewer. The spreadsheet containing the grid cells and their associated leading land use was also exported to Mapviewer. A choropleth map was produced, with the grid superimposed

²⁵ Mapviewer Thematic Mapping Package Ver. 1.1 (Golden, CO:Golden Software Inc.).

over the CBD, and each grid cell assigned a different color depicting the leading land use of that cell. This map revealed that regions of land uses exist within the CBD. Therefore, regionalization was the next step. Lines were interpolated and drawn to create a map displaying the principal land use regions of the Missoula CBD. These maps are analyzed and discussed in Chapter IV.

CHAPTER III

ANALYSIS OF LAND USE IN THE MISSOULA CBD

Introduction. The core of the CBD of a city is generally characterized by

intensive land use, extended vertical scale, limited horizontal scale, limited horizontal change, concentrated daytime population, focus of intracity mass transit, center of specialized functions.²⁶

The Missoula CBD depicts some of these characteristics. A study of the patterns of these land uses has been achieved by Lq mapping. As discussed earlier in Chapter II, mapping the Lq values as interpolated isopleth lines over the CBD was seen as a potentially viable approach to discern regions of land use in the CBD. Choropleth mapping was considered, but was thought to be unsuitable. While choropleth maps can provide information on the precise location of land uses, they are uninformative as to what share of the land is devoted to a particular activity in comparison to other activities. Maps of Lq's, plotted as isopleth lines, are more informative in this respect. They provide information not only on the distribution of the different land uses, but also on the intensity of a land use over the blocks. (See pp. 26-28 for further details.)

Table 4 shows the minimum and maximum location quotient values of different land use activities. Their mean values

²⁶ Hartshorn, Interpreting the City, 336.

Table 4. --Mean, Maximum, Minimum and Standard Deviation Values
of Location Quotients of Different Land Use Activities

CODE	LANDUSE	MIN	MAX	MEAN	STD DEV
11	Household Units	0	16.71	0.96	2.80
12	Group Quarters	0	17.06	0.28	1.91
15	Transient Lodgings	0	8.04	0.77	2.24
23	Apparel and other finished products	0	226.46	1.84	18.68
27	Printing, publishing and allied industries	0	158.39	1.52	13.41
35	Professional, scientific and controlling instruments	0	146.29	1.12	10.96
39	Miscellaneous manufacturing	0	146.36	1.14	12.58
46	Automobile Parking	0	5.26	1.33	1.75
47	Communication	0	54.9	1.01	6.26

Table 4. --Mean, Maximum, Minimum and Standard Deviation Values
of Location Quotients of Different Land Use Activities

49	Other transportation, communication	0	229.04	1.63	16.76
52	Retail Trade-building materials, hardware	0	223.78	1.12	14.63
53	Retail Trade-general merchandise	0	31.3	0.85	4.19
54	Retail Trade-food	0	108.9	0.91	7.57
55	Retail Trade-automotive, marine craft	0	159.57	1.82	14.89
56	Retail Trade-apparel, accessories	0	34.78	0.86	3.74
57	Retail Trade-furniture, home furnishings	0	60.37	1.65	7.33

Table 4. --Mean, Maximum, Minimum and Standard Deviation Values
of Location Quotients of Different Land Use Activities

58	Retail Trade-eating, drinking	0	13.25	1.01	2.46
59	Other retail trade	0	16.32	1.07	2.69
61	Finance, insurance, real estate	0	22.76	1.09	3.67
62	Personal services	0	98.6	1.50	9.10
64	Repair services	0	72.98	1.22	8.13
65	Professional services	0	8.17	0.79	1.60
67	Government services	0	11.88	0.68	2.51
68	Educational services	0	228.64	1.85	16.76
69	Miscellaneous services	0	47.48	1.11	5.22
71	Cultural activities	0	83.44	1.08	7.43
72	Public assembly	0	56.65	0.70	5.45
76	Parks	0	26.51	1.78	6.38
94	Vacant floor area	0	28.82	0.89	3.19
95	Under construction	0	179.98	1.17	12.35

and the standard deviations are also given. The maximum location quotients are seen to be very high for certain land uses, a result caused by a very low number of occurrences in the CBD. For example, Automobile Parking, with widespread use over the CBD, has maximum Lq of 5.26 while Manufacture of Apparel and Finished Products, with a single occurrence, has a maximum Lq of 226.46. Accordingly, land uses which had a high number of occurrences within the CBD were seen to have lower Lq values. As has been discussed in Chapter II (p. 30), the variation is caused by the Lq formula itself, which displays high values for an activity found in a very limited area. That activity naturally has a high share of land use for its grid cell in comparison to other activities whose distribution is more dispersed. A high Lq value belonging to an activity does not indicate that activity to be more important than others; rather it indicates that a given activity has much more than its share of a particular land use in locus compared to all other land uses. The nature of Lq values make it harder to make comparisons to each other. In this thesis, when the importance of a type of land use over others has been studied, it has not been based upon the Lq value. (See Chapter IV.) However, in order to analyze the land use patterns in downtown, the Lq values have been found to be highly useful for judging the intensity of a land use over the CBD.

The table shows that the minimum Lq value is 0 for

every land use activity, caused by the fact that none of the land use activities were present in all of the grid cells over the CBD.

The maximum Lq values range from 5.26 (Automobile Parking) to 229.04 (Other Transportation and Communication). The table also provides information about the mean values and the standard deviations. The mean values range from 0.28 to 1.85. They cluster around 1.2, indicating that the downtown is not dominated by any single activity. Obviously the dispersion is much less pronounced when the mean values are compared. The standard deviation values also show interesting comparisons. These values range from a highest of 18.68 to a lowest of 1.75. The highest standard deviation values belong to activities with the highest location quotient values.

Later, in Chapter IV, while regionalizing the major land uses of the central business district of Missoula, the standard deviation values above the mean were taken into account as the basis for the regionalization.

In this chapter, a discussion of the different land use patterns of the Missoula CBD is undertaken by describing and analyzing the isopleth maps of the location quotients of different land uses. The land uses discussed are those that occur in Missoula CBD and do not include the rest of the land use classes found in Standard Land Use Coding Manual.

In order to make the discussions and the analyses convenient, each block has been identified with an alphabetical name and is referred to by that name (Map 4).

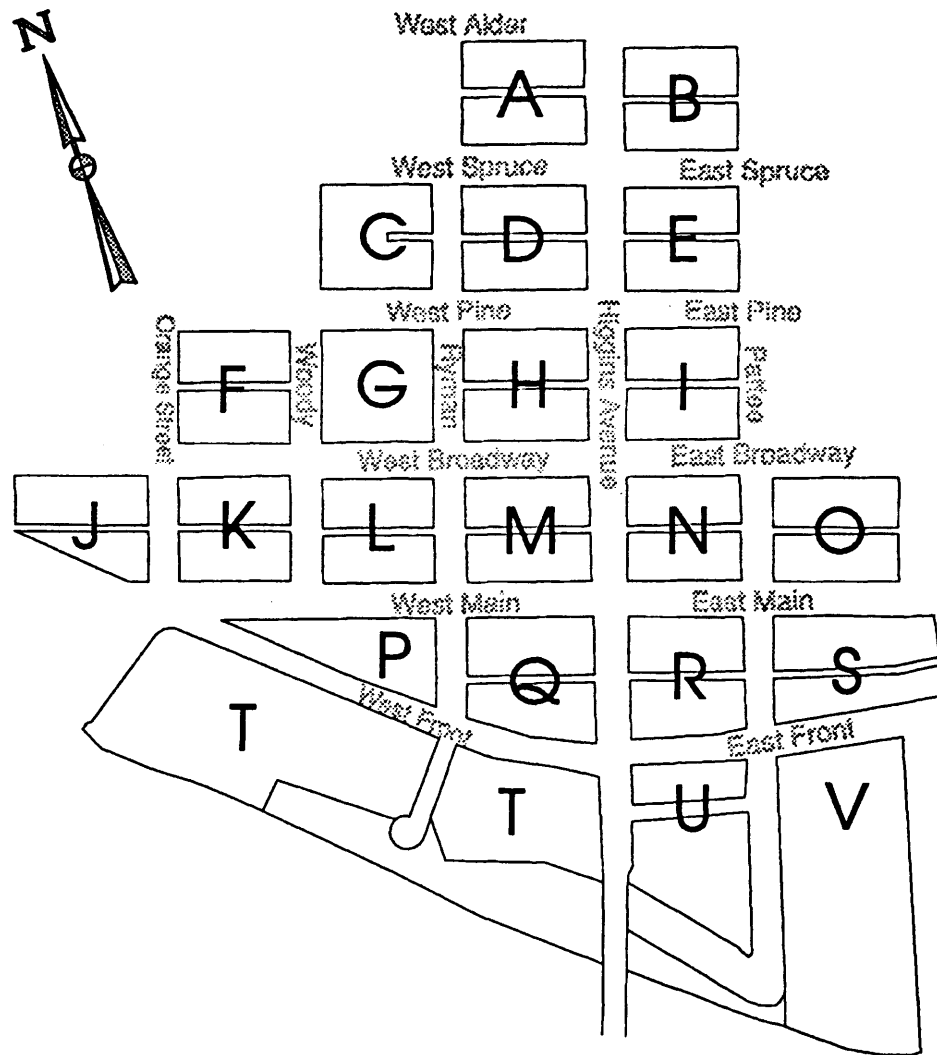
Residential Land Use. In the Standard Land Use Coding Manual, this category has been studied under several groups at the second digit level of classification. In the Missoula CBD, only the following residential land uses were found and studied:

1. Household Units: This includes houses, apartment units, a group of rooms or a single room "that is intended for occupancy as separate living quarters."²⁷
2. Group Quarters: Rooming and boarding houses, fraternity and sorority houses, membership lodgings, residence halls or dormitories, retirement homes or orphanages, religious quarters, and other miscellaneous group quarters are included in this category.
3. Transient Lodgings: This includes hotels, tourist courts, and motels and other transient lodgings which comprise such establishments as the YMCA, YWCA,

where 50% or more of the floor area is devoted to lodging and associated

²⁷ Standard Land Use Coding Manual, 32.

CBD of Missoula



0 150 300 600 900
Scale in Feet

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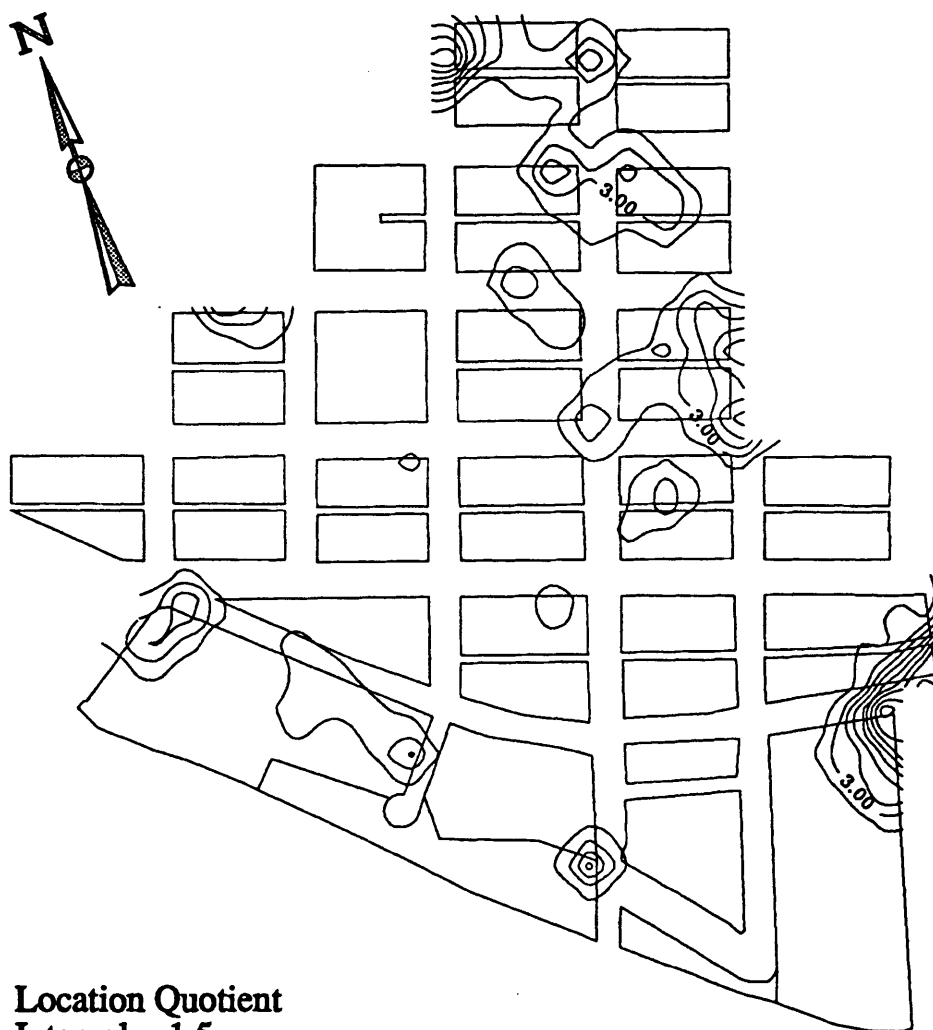
Map 4

activities and where less than 75% of the accommodations are occupied by permanent guests.²⁸

Household Units. Map 5 shows household units located in isolated clusters along the outer fringe blocks of the CBD. The isolines are spread over some blocks along Higgins Avenue as well. The two largest concentrations are found along block A on Alder Street and on the blocks S and V on Washington Street. These three blocks show isolines with location quotient values as high as ten. On block A, there are household units on the ground floor, along with several upper floors of household units, which account for the high location quotient values found here. The isoline showing the Lq value of three has spread over the blocks D and E. Block D has one household unit on the ground floor facing the alley and several household units on the upper floors. Block E also has a number of household units on the upper floors. Block I shows isolines with Lq values of three and six, values produced by the superimposition of apartment dwellings, one at the ground floor level and others on the upper levels. Block S displays a thick concentration of isolines which pass through the northeast corner of Block V as well. The values range from one to twelve. The location of household units on the ground floor and the upper floors

²⁸ Ibid.

Household Units



Location Quotient
Interval = 1.5

0 150 300 600 900
Scale in Feet

Rina Ghose

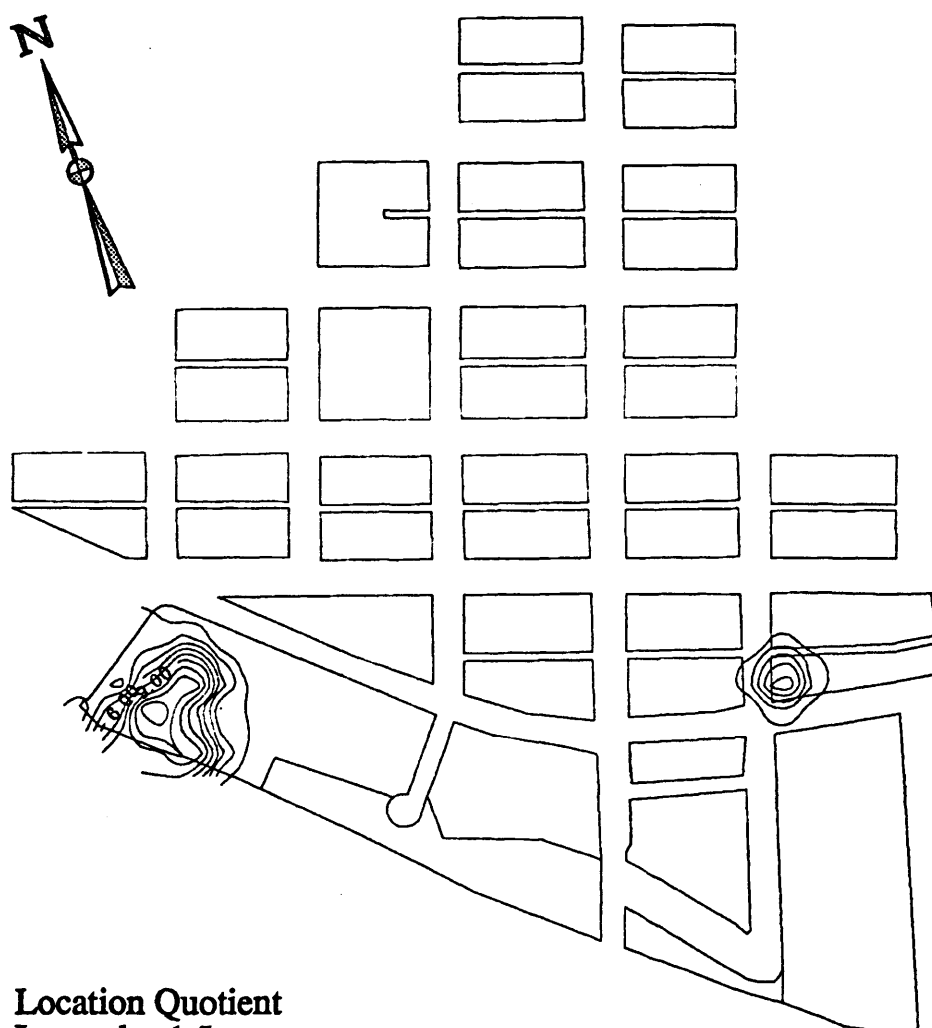
Map 5

of the block S is responsible for this. Block V also shows residential units on the ground floor as well as on the upper floors.

The household units in the CBD are normally found to be in the blocks which are commercially less valuable and which usually lie on the fringe of the CBD. The units are also mostly located on upper floors, which are less attractive locations for commercial purposes. In addition, some of these blocks are also found close to the boundary of the CBD zone and are adjacent to blocks which are zoned as residential. This is true of block S, which could explain its heavy residential land use.

Group Quarters. In the Missoula CBD, only two buildings qualified as group quarter land use (Map 6). One was the Clark Fork Manor, a retirement home, and the other was a membership lodging. Consequently, two concentrations of isolines are found--one in the left corner of block T, and the other in the block S. Block T has a retirement home, and consequently displays isolines with location quotient values as high as 13.5; block S, by contrast has a membership lodging and shows isolines with the Lq value of 7.5. The rest of the CBD is devoid of group-quarter land use. These land uses are also found in the fringe blocks of the CBD with lower land values. In spite of being located in fringe blocks, they can be easily accessed, for both

Group Quarters



Location Quotient
Interval = 1.5

Rina Ghose

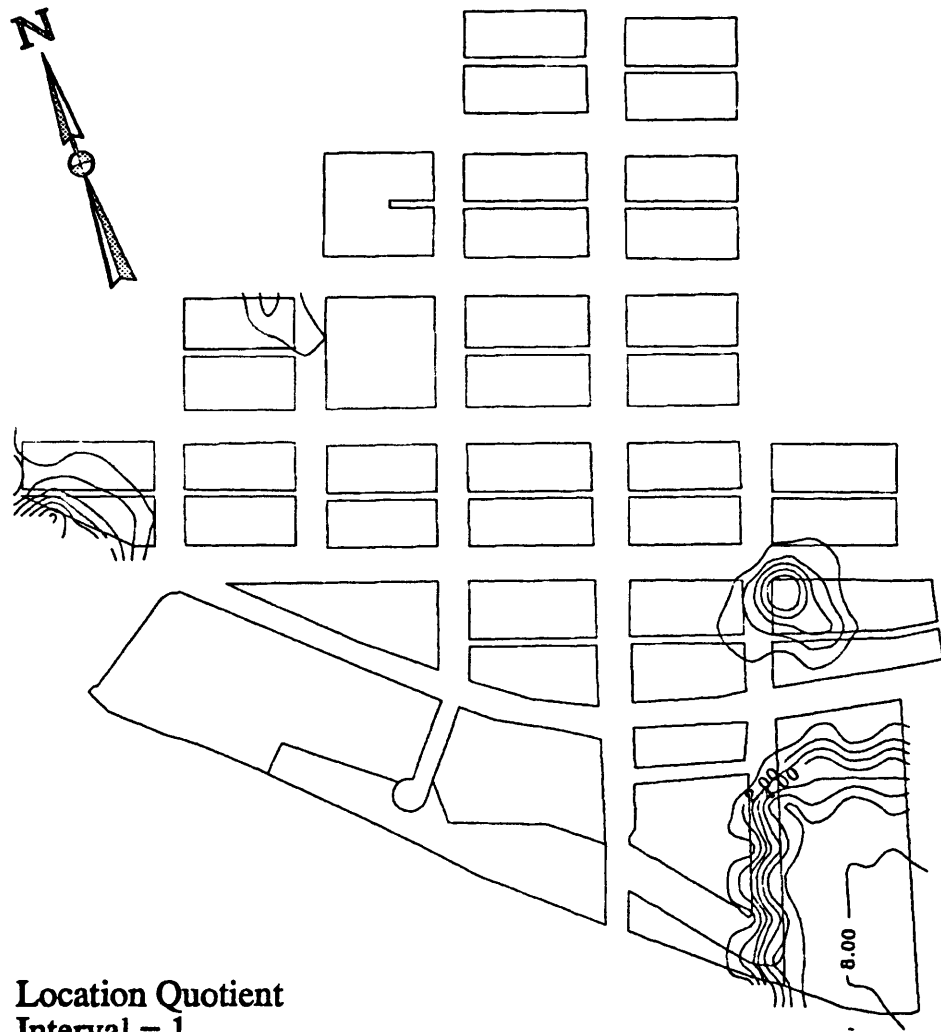
Map 6

these two places are located along Front street, a major street in the CBD.

Transient Lodging. Hotels and motels constitute notable land uses of any CBD. In the Missoula CBD, three major concentrations of isolines are found in block J, block S and block V, with a few minor lines in block F (Map 7). Block V has the thickest concentration of isopleth lines with Lq values ranging from one to eight. The reason for these high Lq values is the presence of the Holiday Inn, one of the largest hotels in Missoula. Block S has a moderate-sized motel, the Executive Inn, which justifies its isopleth lines having Lq values ranging from one to five. Block J also has a motel in it, which brings up its isoline bearing the highest Lq value up to five.

Similar to the other types of residential land use, the hotels and motels are found to be located along the fringe areas of the CBD, where land values were possibly lower and where it was perhaps less expensive to modify or construct large buildings for the hotel or motel use. At the same time, these transient lodgings are located close enough to the heart of the CBD to satisfy the clientele who may be looking for lodging in the downtown. Of the three types of residential land use, household units seem to predominate, for they are most widely spread. Although most residential land use is found along the fringe blocks of CBD, household

Transient Lodging



Location Quotient
Interval = 1

0 150 300 600 900
Scale in Feet

Rina Ghose

Map 7

units are found in patches along Higgins Avenue, one of the most important streets in the CBD. The reason is that household units are found mostly in upper floors, which are less in demand by businesses. A comparison also shows that land has been most intensely used by the Holiday Inn hotel and the Clark Fork Manor and a cluster of household units in block S and V.

Manufacturing Land Use. In the Missoula downtown, only four types of manufacturing activity are found; thus, manufacturing land uses were studied under the following categories:

1. **Manufacturing of Apparel and Other Finished Products:**
This category includes manufacture of finished products made from fabric, leather and other similar materials. It includes as well manufacture of clothing and accessories as well as curtains, draperies, house furnishings, textile bags, canvas products and other fabricated textile products.
2. **Printing, Publishing and Allied Industries:** Publishing and printing of newspapers, periodicals, books, commercial printing, manufacturing of business forms, greeting cards, bookbinding and other related industries and printing trade services are the concerns of this category.
3. **Manufacturing of Professional, Scientific and**

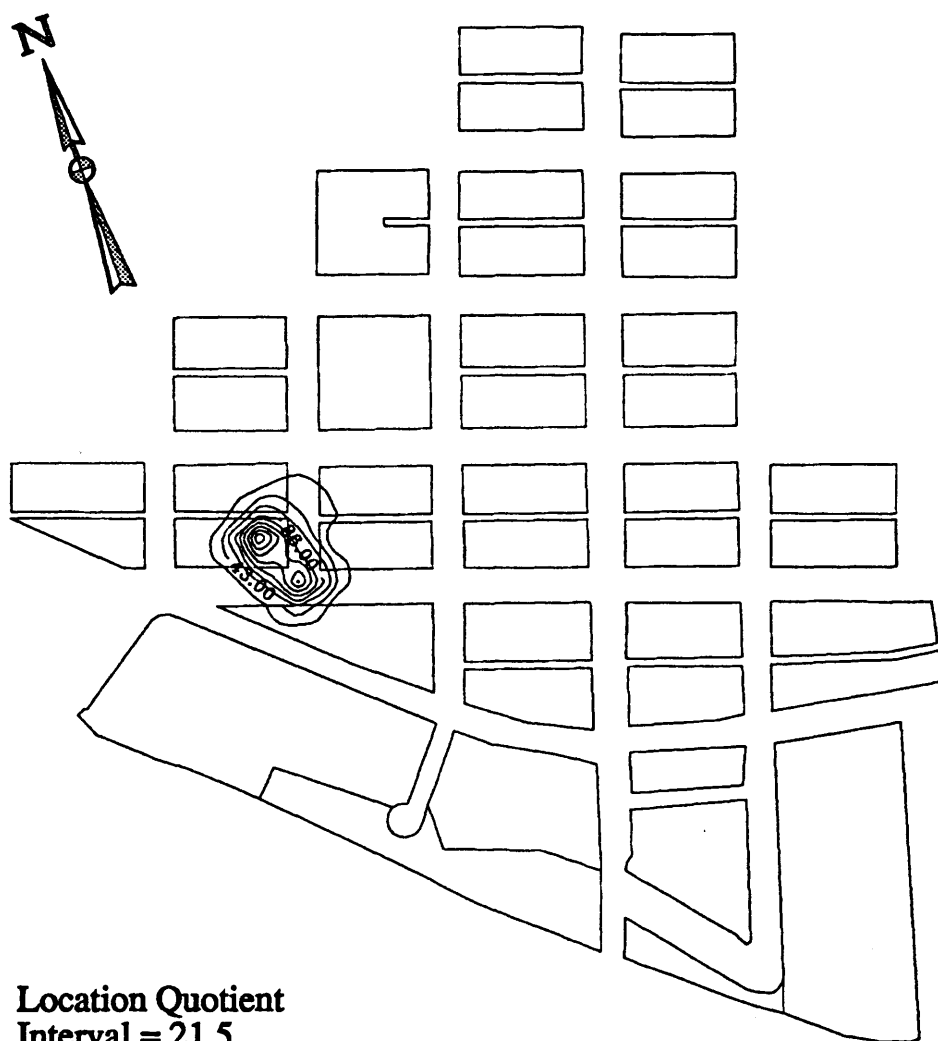
Controlling Instruments: This includes manufacturing of engineering, laboratory, scientific and research instruments, optical instruments and lenses, surgical, medical and dental instruments and supplies, ophthalmic goods, photographic equipment and supplies, watches, clocks and clockwork devices.

4. **Miscellaneous Manufacturing:** Items in this category include manufacturing of jewelry, silverware and plated ware, musical instruments and parts, toys, amusement, sporting and athletic goods, pens, pencils and other office and artists' materials, costume jewelry, costume novelties, tobacco, motion picture production, and other miscellaneous manufacturing activities.

Manufacture of Apparel and Other Finished Products. There is but a single occurrence of this land use activity in the Missoula CBD (Map 8). Block K shows the store Blue Star Canvas, which is involved in the manufacture of finished products made from canvas, including tents and awnings. This singular occurrence gives rise to isopleths with L_q values with a maximum of 226.46.

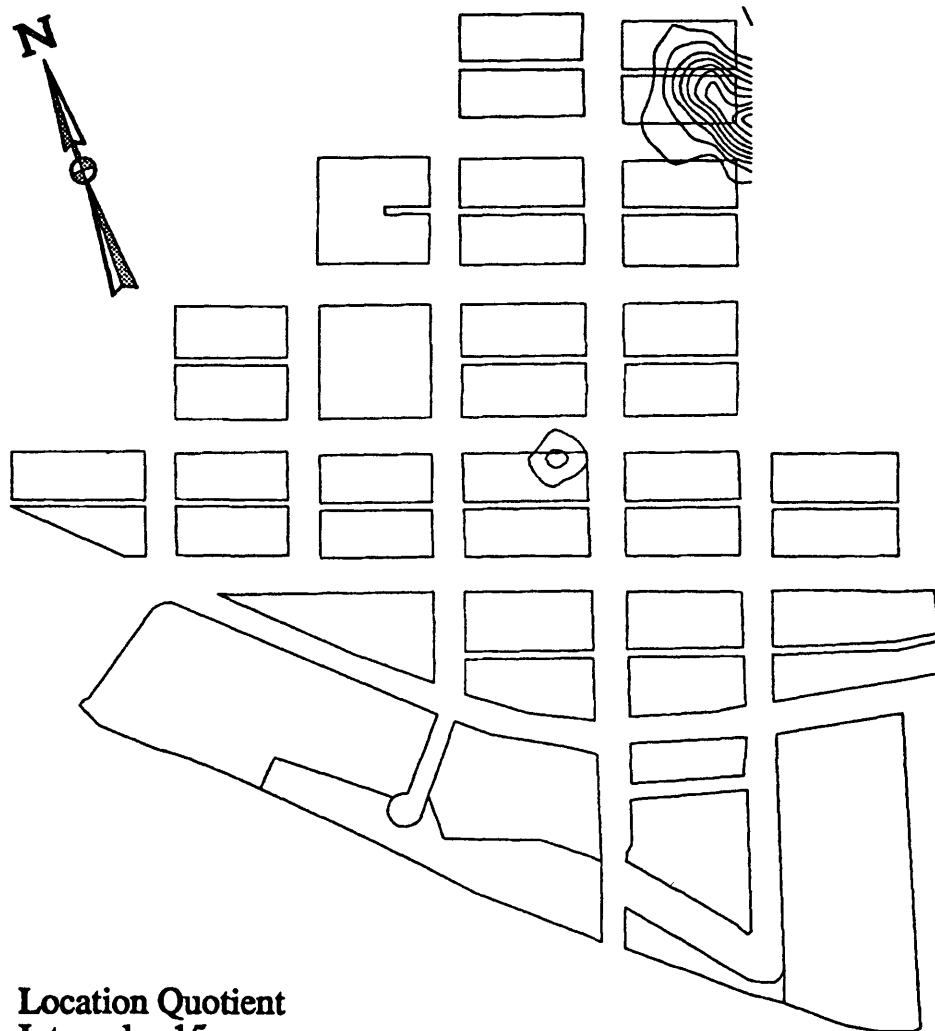
Printing, Publishing and Allied Industries. Block B displays a thick concentration of isopleth lines due to the presence of Artcraft Printers (Map 9). Isopleth lines show values as high as 135. Block M has a smaller printing and

Manufacturing: Apparel and Other Finished Products



Map 8

Manufacturing: Printing, Publishing and Allied Services



Location Quotient
Interval = 15

0 150 300 600 900
Scale in Feet

Rina Ghose

Map 9

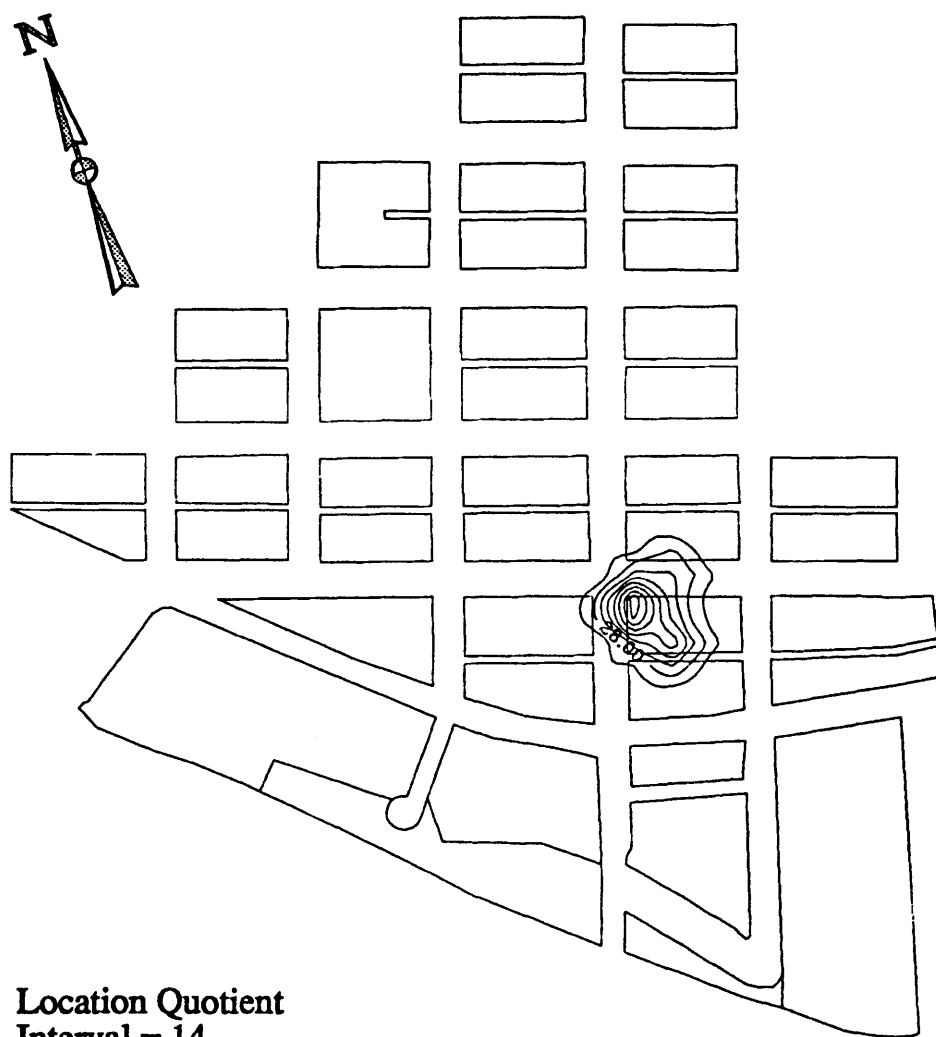
copying service and its isopleth value peaks at 30.

Manufacture of Professional, and Scientific Instruments.

There is only a single occurrence of this type of land use in the entire CBD, and it occurs in block R where one shop involved in the manufacture and selling of optical instruments and lenses can be found (Map 10). Due to the single occurrence of this land use, isopleth lines with high location quotient values are found, the maximum value being 146.29. The isopleths form a cluster on the block R and show a high intensity of this land use.

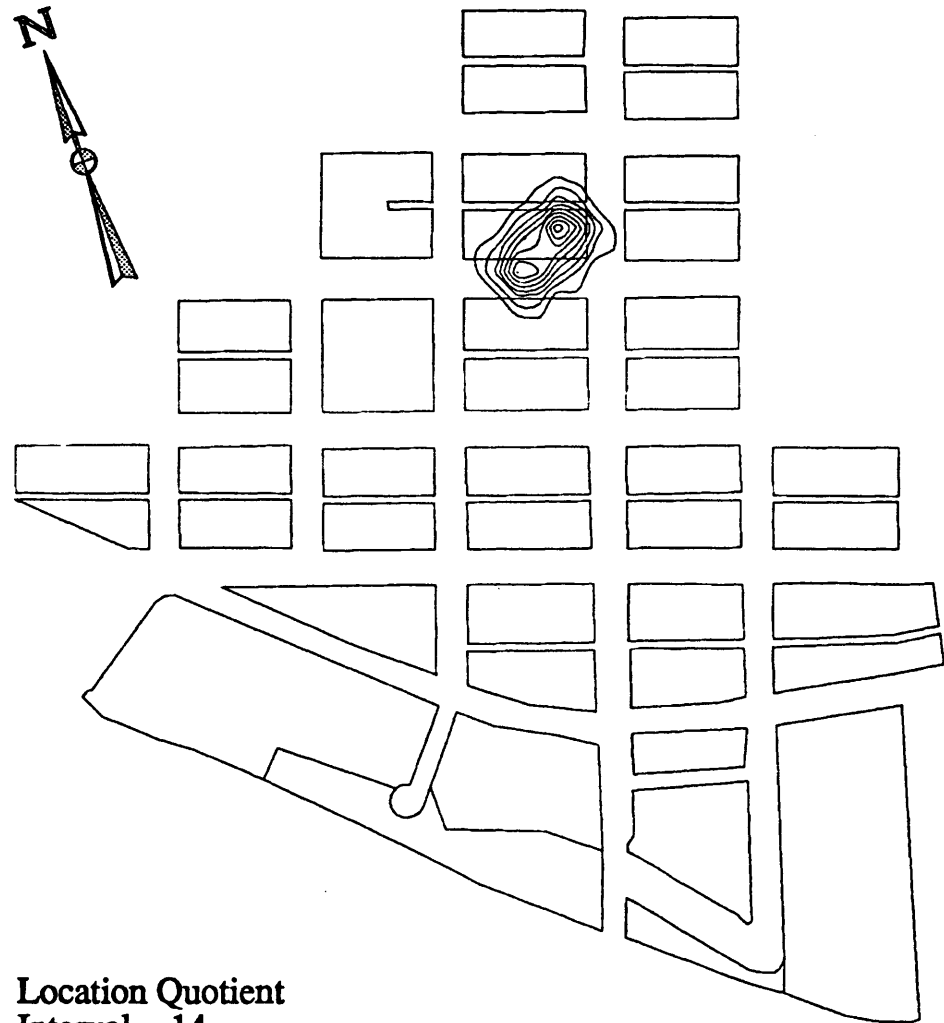
Manufacture of Miscellaneous Goods. This category again shows just a single occurrence in the CBD (Map 11). In block D, a store is found to have the function of manufacturing musical instruments and parts as well as being a recording studio. The isopleth lines are concentrated and lie close to each other, showing a high intensity of land use, the location quotient values are high, and the isopleth line with the maximum Lq value is 146.36. All of the manufacturing activities show a high intensity of land use. The optical goods store is located on Broadway and near Higgins. It required smaller floor space and could locate itself on a block which contains at least six boutiques and accessories type shops, in addition to a few diners. It is thus available to the pedestrian traffic, which is

Manufacturing: Professional and Scientific Instruments



Map 10

Miscellaneous Manufacturing



Location Quotient
Interval = 14

0 150 300 600 900
Scale in Feet

Rina Ghose

Map 11

beneficial to the optical goods shop. The Blue Star Canvas is a larger store which requires considerable floor space; thus it is located on a block where such building footage is available. In addition, it has the advantage of having a large parking lot beside it, a factor which could have influenced its location as well, especially since the nature of its business demands the use of vehicles. Art Craft Printers is located closer to the northern fringe of the CBD. It is a large establishment and perhaps the availability of less expensive land in this block influenced its decision to locate here. In addition, it also has the advantage of having a large parking lot in the same block. The store involved in manufacturing musical parts and containing a recording studio is located in block D, a choice possibly influenced by the location of the KLCY radio station in the same block.

Transportation, Communication and Utilities land Use. This was studied under three categories, which are listed below.

1. Automobile Parking. This includes both commercial and private parking.
2. Communications. Telephone communication, telegraph communication, radio communication, television communication, radio and television communication as a combined system are the activities which fall into this category.

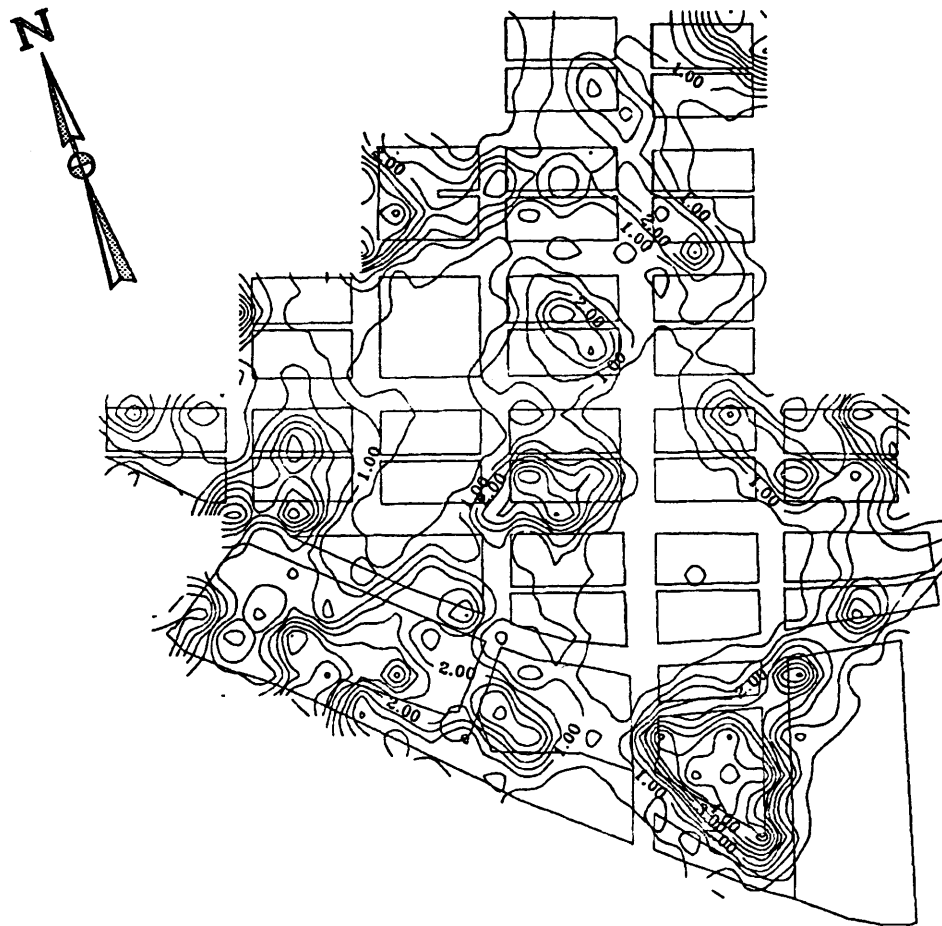
3. Other Transportation, Communication and Utilities.

These include pipeline rights-of-way and pressure control stations, transportation services and arrangements, other transportation, communication, and utilities.

Automobile Parking. Automobile Parking includes parking garages and parking lots. This land use is one of the most common ones; it occurs all over the CBD (Map 12). The isopleths form clusters which are found in almost every part of the CBD. The most notable of these correspond to either parking structures or large parking lots. The highest location quotient value for this land use is 5.26. Since automobile parking land use is widely disseminated, its maximum location quotient value is much lower than most. Usually, the parking lots are found near businesses, as well as office buildings, hotels, and restaurants.

Communication. This land use is found in three blocks, D, K and N (Map 13). KLCY radio station is found in block D. The block shows a concentration of isolines with a peak location quotient value of 35. Block K has the KECI television station, which appears as a small concentration of isolines. The line with the highest Lq value is 25. Block N contains the offices of Mountain Bell telephone company; it has a large number of isolines forming a thick

Automobile Parking



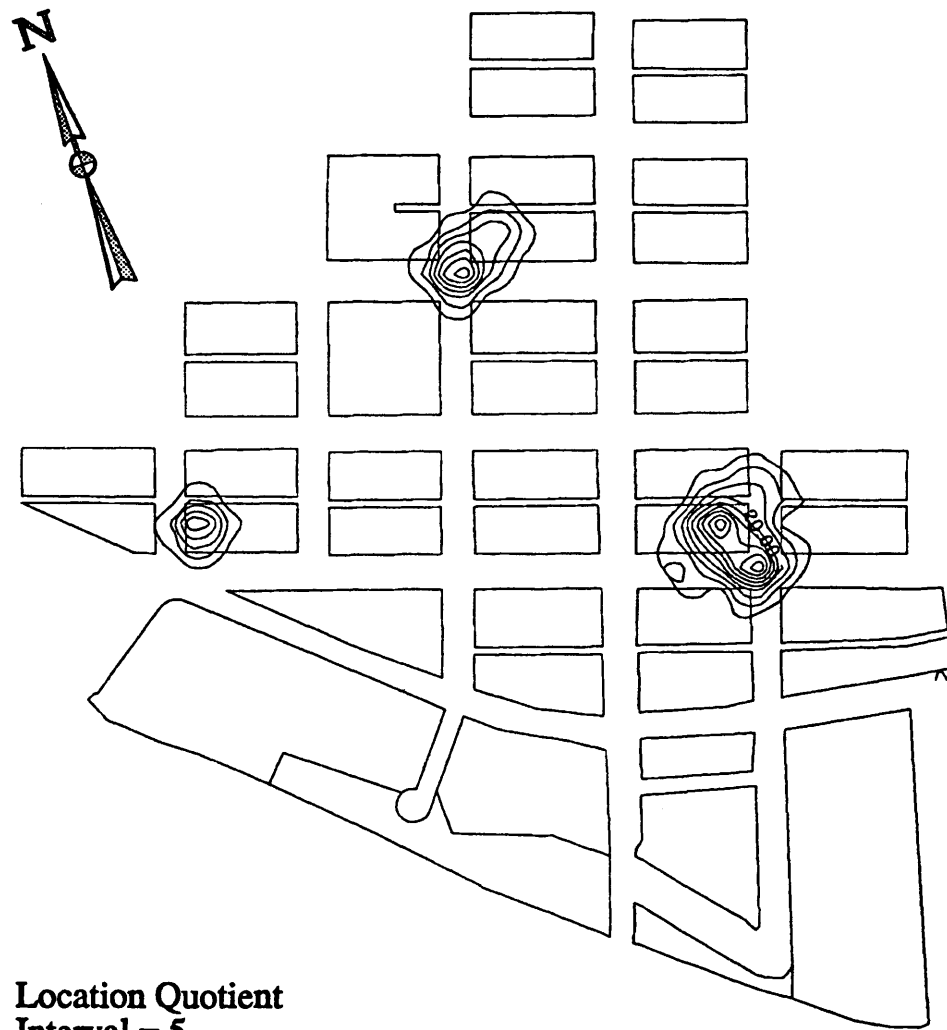
Location Quotient
Interval = 0.5

0 150 300 600 900
Scale in Feet

Rina Ghose

Map 12

Communication



0 150 300 600 900
Scale in Feet

Rina Ghose

Map 13

cluster, reaching Lq values of 45. Overall, the maximum location quotient value for this land use is 54.9.

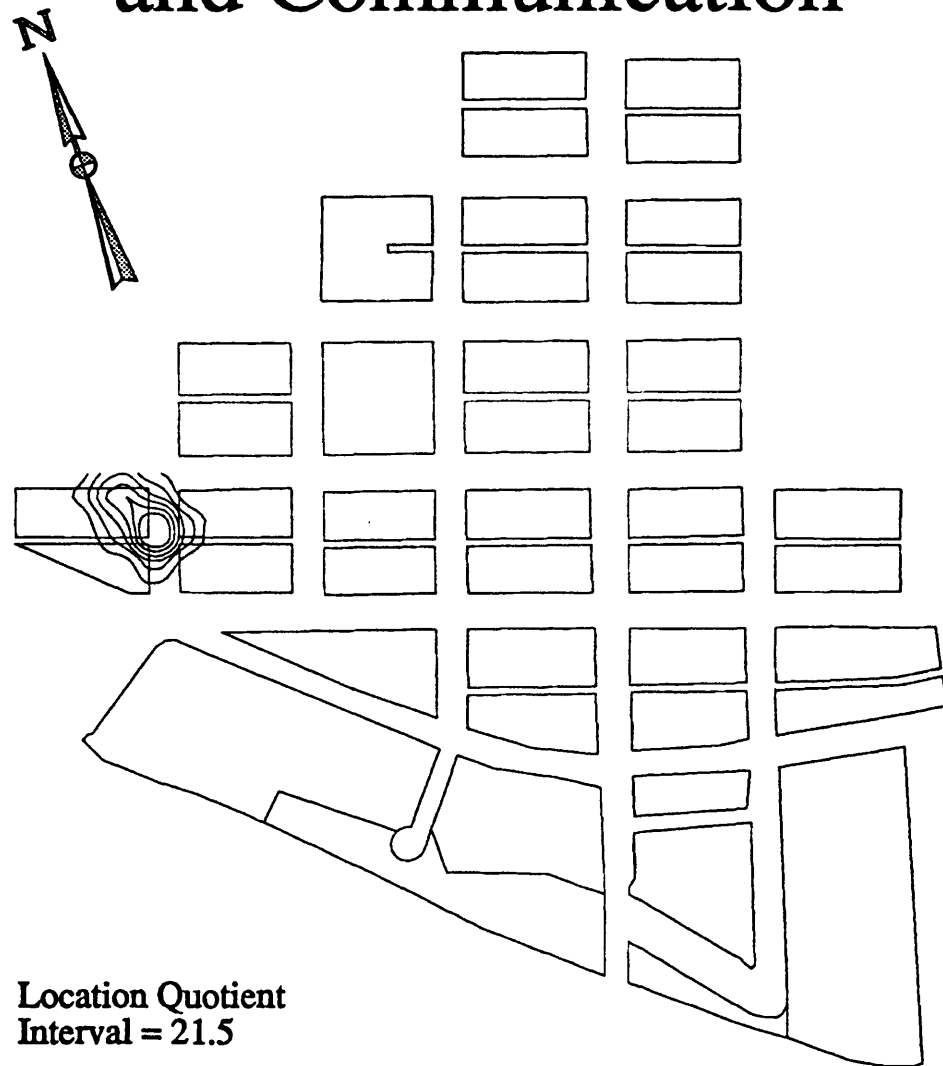
Communication land uses are found to be located in three different parts of the CBD and do not form a contiguous region. The T.V. station and the Mountain Bell company have their offices located along Main Street, one of the busiest streets of the CBD. The radio station is located on Pine street. While all three appear to be located in the fringe blocks of the CBD, they are actually quite close to the PLVI²⁹, all of them being within one to two blocks of that point. In addition, they are all found near large parking facilities.

Other Transportation, Communication and Utilities. There is only a single occurrence of this category of land use in the entire CBD (Map 14). In block J, a travel agency is found, a business which falls within the activity classification of providing transportation services and is thus included in this category. It is located along the fringe area of the CBD. The single instance gives rise to isopleths bearing high location quotient values of 229.04.

Overall, when comparing various types of transportation and communication land uses, automobile parking is the most dominant one. The others show a higher intensity of their land usage, but are not evenly distributed.

²⁹ Please refer to p. 9-10 for a discussion of PLVI.

Other Transportation and Communication



Map 14

Trade land use. This category includes wholesale trade and retail trade. In the Missoula CBD, only retail trade is found, which has been studied under the following categories:

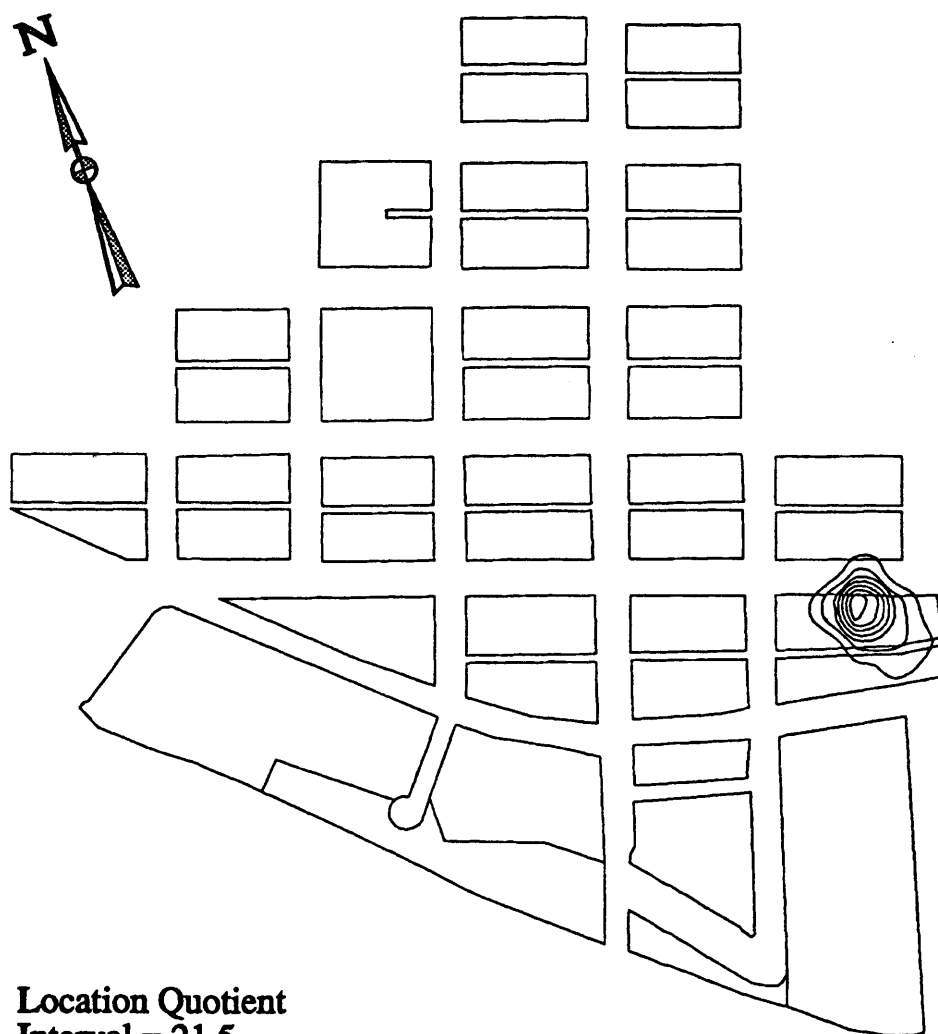
1. Retail Trade of Building Materials, Hardware and Farm Equipment. Retail trade of lumber and other building materials, heating and plumbing equipment, paint, glass, and wallpaper, electrical supplies, hardware and farm equipment are all included here.
2. Retail Trade of General Merchandise. The units included are department stores, mail order houses, limited-price variety stores, merchandise vending-machine operators, direct-selling organizations and other general merchandise.
3. Retail Trade of Food. This includes retail sales of groceries, meat and fish, fruit and vegetables, candy, nut and confectionery, dairy products, bakeries and other foods.
4. Retail Trade of Automotive, Marine Craft, Air Craft and Accessories. Items included are retail trade of motor vehicles, tires, batteries and accessories, gasoline service stations and other automotive and accessories.
5. Retail Trade of Apparel and Accessories. This contains retail trade of men's and boy's clothing and furnishings, women's ready-to-wear, women's accessories and specialties, children's and infant's wear, family

clothing, shoes, custom tailoring, furriers and fur apparel and other apparel.

6. Retail Trade of Furniture, Home Furnishings and Equipment. Furniture, home furnishings and equipment, household appliances, radios, televisions and music supplies together comprise this category.
7. Retail Trade of Eating and Drinking. Included are eating places and drinking places.
8. Other Retail Trade. This consists of retail trade of drug and proprietary paraphernalia, liquor, antiques and secondhand merchandise, books and stationery, sporting goods and bicycles, farm and garden supplies, jewelry, fuel and ice and other retail trade.

Retail Trade of Building Materials, Hardware and Farm Equipment. This type of land use occurs in block S, which has a shop selling glass works (Map 15). Due to the single occurrence of this land use in the entire CBD, the maximum Lq value is 223.78. The isopleth lines form a closely spaced, thick cluster over block S. The store occurs in a fringe block of CBD, but has the advantage of being only a block and a half away from the PLVI, which is also the focus of pedestrian traffic. This block also contains a furniture shop, and these two stores might have influenced each other's location to a certain extent, since they attract a similar clientele.

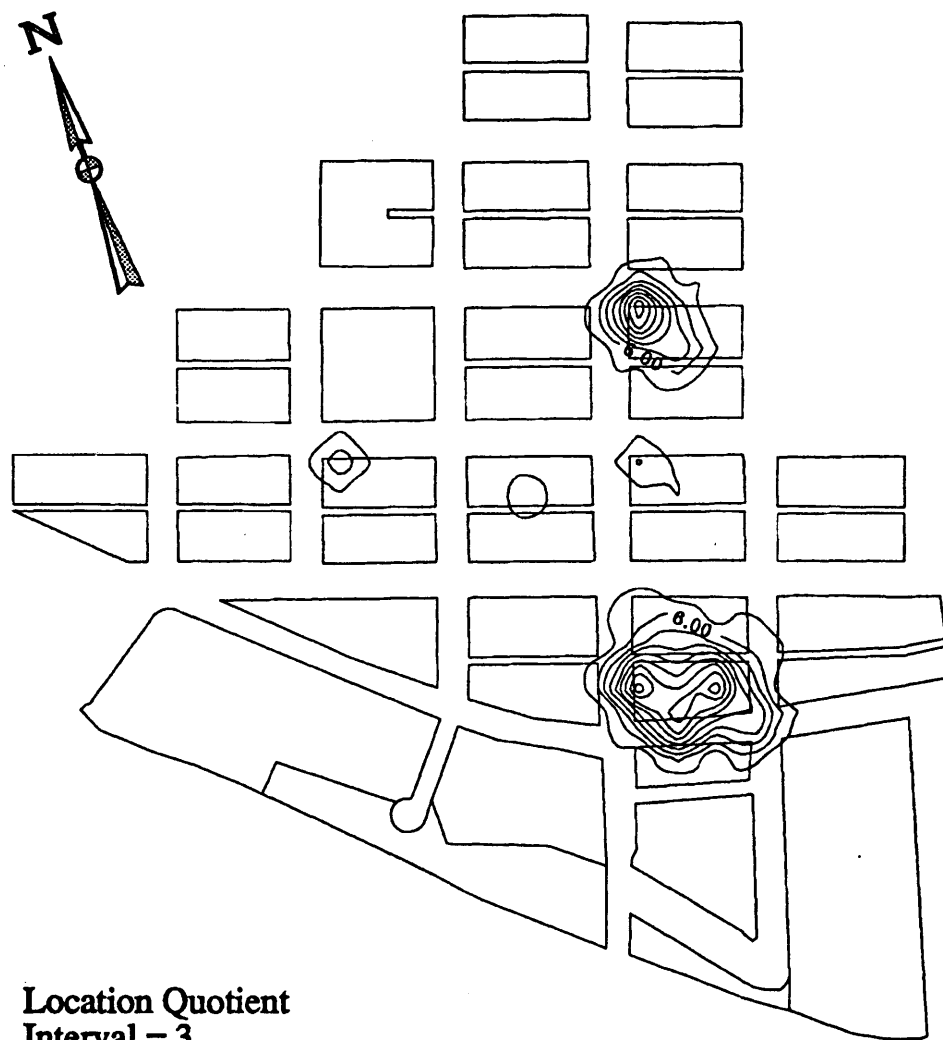
Retail Trade: Building Materials and Hardware



Map 15

Retail Trade of General Merchandise. This type of land use is found over a few blocks in the CBD. Blocks I, L, M, N and R all possess this type of land use (Map 16). Isopleths having values as high as 31.3 are found. Block R shows a large cluster of isopleth lines, with peak values at 27. This can be attributed to the presence of The Bon Marche, a large department store involved in the retail trade of general merchandise. Its location is not a surprise, for this block is heavily involved in retail trade of clothing, jewelry, accessories etc. The Bon Marche caters to the same clientele because of its large clothing section, in addition to other merchandise. All of these stores have probably influenced each other's locations by competing for similar customers. The Bon Marche is also located within a half block of the PLVI and, therefore, has maximum accessibility to pedestrian traffic. Indeed, a large number of stores involved in sale of clothes and accessories have located themselves along Higgins Avenue, competing for pedestrian traffic. Block I shows a moderate cluster of isopleth lines, which is caused by the location of Wyckman's, an office supply store falling under the category of "other general merchandise." Isolines with values up to 24 are found here. It is a large store and might have chosen its location two blocks away from the PLVI on purpose because of the lower land values found here. However, since the major corridor of pedestrian traffic is along Higgins Avenue, it

Retail Trade: General Merchandise



0 150 300 600 900
Scale in Feet

Rina Ghose

Map 16

does not lose out on accessibility either.³⁰ Blocks L, M and N all show the presence of office supply stores which have a lower intensity of land use than block I where Wyckman's is located. Blocks N, M and L all have banks, offices and bookstores, activities that provide business for office supplies. This has likely influenced their decisions to locate along Broadway. Of the three, block N has the largest store, Delaney's, the location of which is within a block of the PLVI. It is located in a block that contains a bank, three floors of offices for professionals in different fields, and three floors of offices belonging to the Mountain Bell phone company. In the case of Delaney's, clearly it would seem to be an advantage to have a large clientele located in the same block.

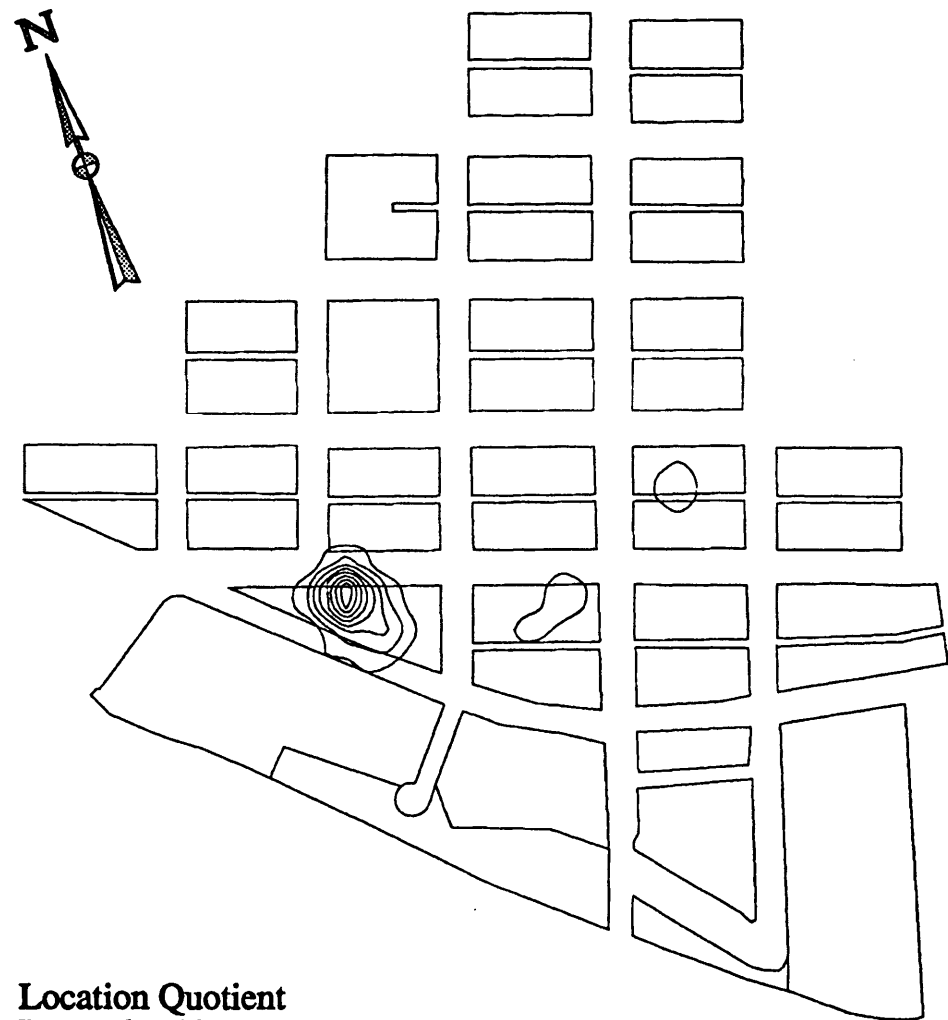
Examination of the map reveals that three of the total of five stores are located along Higgins Avenue and one within half a block of Higgins. In addition, this area is found to contain a large number of stores dealing with retail trade of apparel and accessories, a trade that closely rivals some of the products sold by traders of general merchandise. In the case of the Bon Marche, the advantage of this location is clearly its appeal to pedestrian traffic passing along the Higgins Avenue. Moreover, a number of collateral professional services are

³⁰ The CBD study of Missoula done by Filchak, Hartmann and Thomas provided information about the land values of the CBD.

located in the nearby blocks, an advantage attractive to potential customers of both the Bon Marche and the different office supply stores. For the Bon Marche, the workers in these offices are often their customers. For the office supply stores, the professional services themselves are the direct customers of their goods.

Retail Trade of Food. Blocks N, P and Q contain clusters of isopleth lines, indicating the presence of some type of retail activity in food in these blocks (Map 17). Overall, this type of land use has a maximum location quotient value of 108.9. Block P displays a high intensity of this particular land use, depicted by a thick cluster of isopleth lines; the highest value in the cluster is 81. This is caused by the presence of a bakery. It is found near the western fringe of the CBD and is located beside a cafe that attracts a similar clientele. It is also located within half a block of Front Street, which contains offices, coffee shops, diners, and other bakeries. It essentially competes for a like clientele and is close enough to benefit. Its location in a block with relatively low land values is of advantage as well. A similar situation occurs in Block Q, which also contains a small bakery and shows a low intensity of this land use. This block has several restaurants and bars, in addition to having retail stores and a few offices, all of which bring similar clientele. The Butterfly

Retail Trade: Food



Location Quotient
Interval = 10

0 150 300 600 900
Scale in Feet

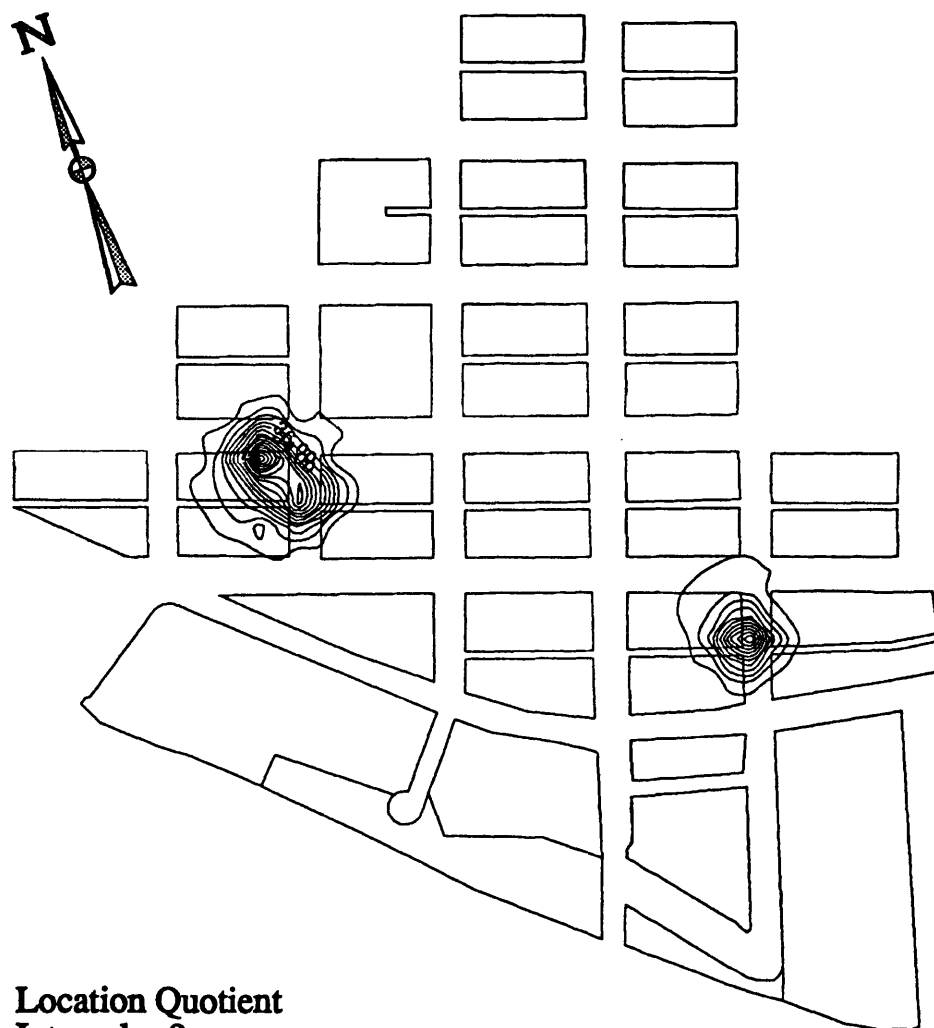
Rina Ghose

Herbs, a coffee and herb store located in Block N, shows a low intensity of this type of land use. It is also located in a block that contains several popular retail stores, restaurants and a large number of offices. Undoubtedly, these bring in customers who may also choose to stop at this shop.

Retail Trade of Automotive, Marine Craft, Air Craft and Accessories. The maximum Lq value for this land use is 155.59. Blocks K and R display isopleth lines indicating the presence of this type of land use (Map 18). Block K contains an auto repair shop which is also involved in selling automotive parts. This store has caused a thick concentration of isopleth lines, the most valuable line being 144. Block R has a smaller cluster of isopleth lines with a peak value of 96, a figure produced by the presence of a tire shop. Overall, this land use category produces high Lq values due to the small number of activities present in the CBD. There is a distinct tendency for them to be found toward the edge of the CBD, as one would expect from a trade relying primarily on customers driving automobiles.

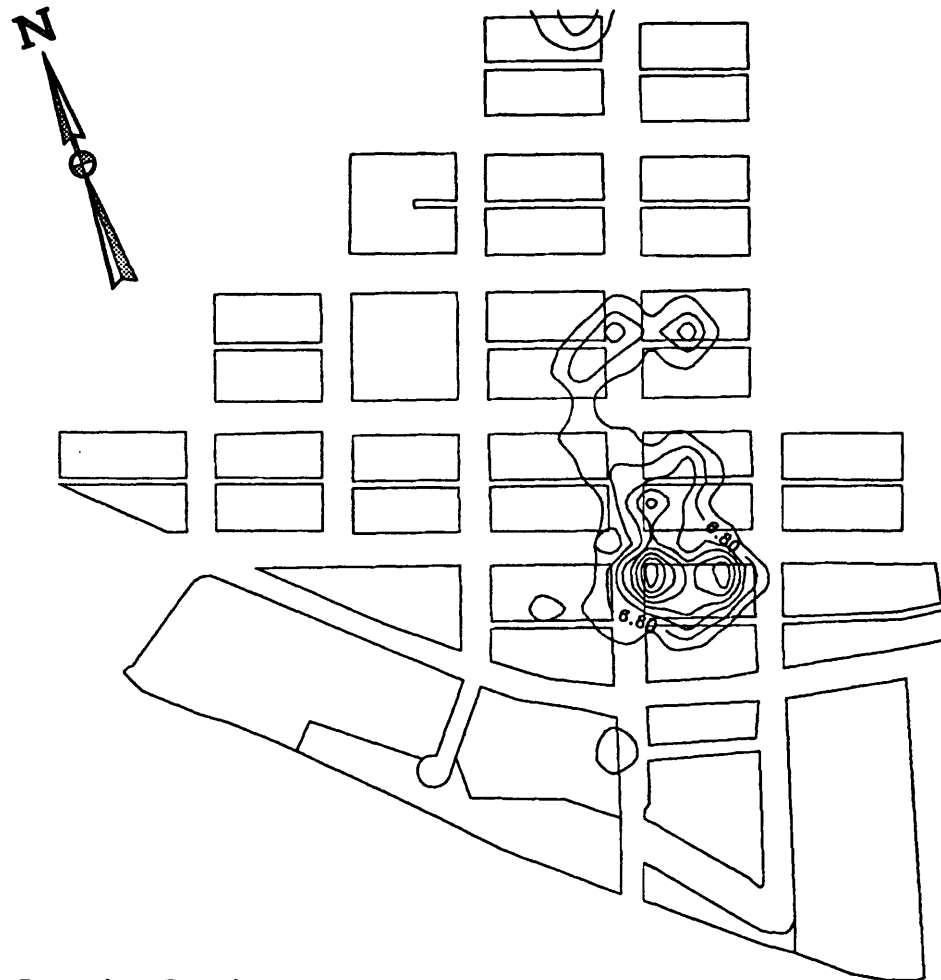
Retail Trade of Apparel and Accessories. Several blocks adjacent to each other along Higgins Avenue in the CBD contain land use of this type (Map 19). The maximum Lq for this land use is 34.74. Retail trade of apparel and

Retail Trade: Automotive, Marine Craft



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Retail Trade: Apparel and Accessories



Location Quotient
Interval = 3.4

0 150 300 600 900
Scale in Feet

Rina Ghose

Map 19

accessories is found in the blocks A, H, I, M, N, Q, R and T. Block A has a small shoe store represented by a few contour lines passing through it. Block H has a clothing store, and block I has the Army and Navy Economy Store, which deals in clothes and accessories, activities extending through the second floor. Both of these blocks show isolines with values of 12. Block M has two stores having this type of land use, one being a ladies' clothing store and the other a shoe store (Ogg's). This block has a couple of isolines passing through it, indicating a moderate amount of land use. Block N, on the other hand, displays a higher intensity of retail trade land use, and has an isoline with Lq value of 18. It has three stores dealing with the trade of clothing and accessories. Block Q has a few isopleth lines running through it and contains two stores with this type of activity. Block R shows the highest intensity of land use in retail trade of clothes and accessories. Its peak value lies at 27. This block has seven shops selling clothes and accessories. Block T has a couple of isopleth lines, caused by the location of a clothes and accessories shop.

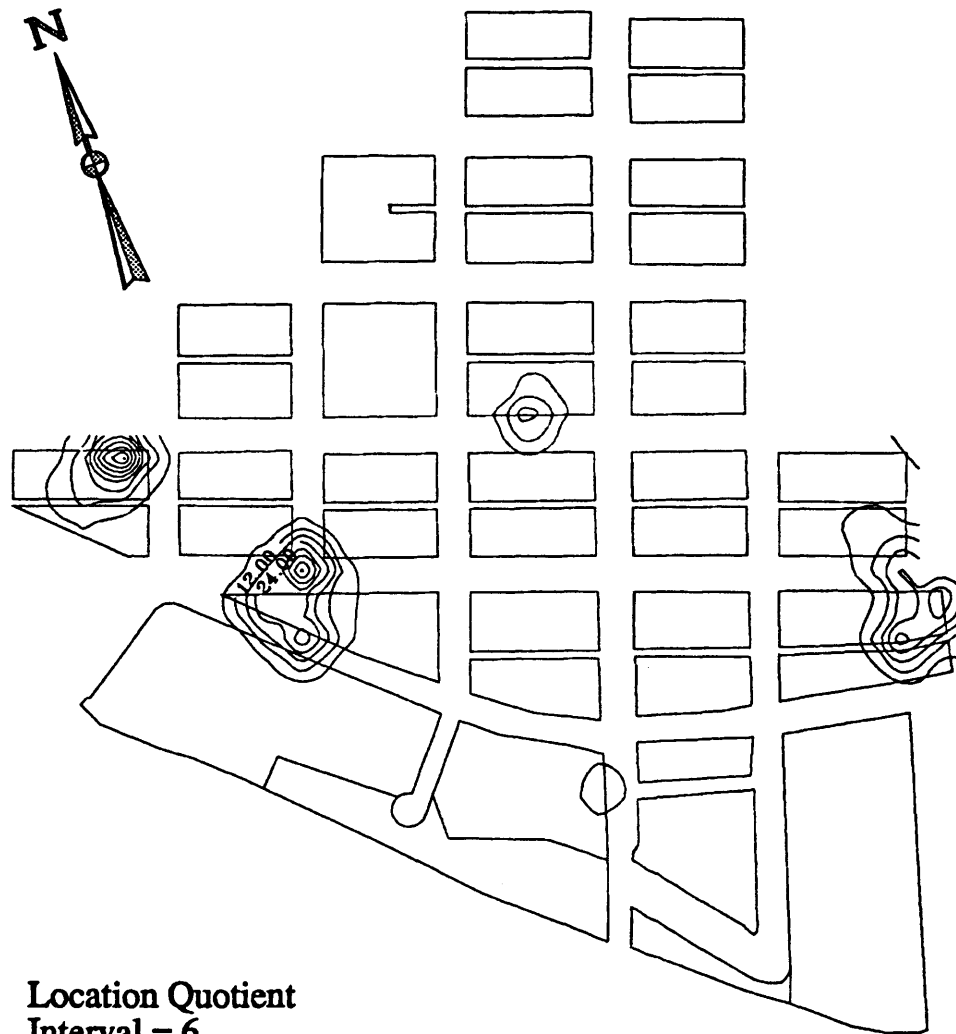
An analysis of the map reveals that the stores with this type of land use are located along Higgins. The reason for this location is that the pedestrian traffic is very high along this street, as well as along the two neighboring east-west streets, Main and Broadway. There are a number of

restaurants and diners, plus a large number of offices on these streets, which bring in additional potential clientele. A noticeable fact is that the PLVI lies at the intersection of Higgins and Main. Despite the high land values, most of the stores dealing in retail trade of clothes and accessories attempt to locate as close to the PLVI as possible in order to benefit from the maximum traffic at the intersection of Higgins and Main. In addition, while doing the land use survey, the researcher noticed that the quality of buildings and land in the CBD was higher to the south of PLVI but lower toward the north. In support of this finding, the stores found along blocks M, N, Q and R tended to contain more expensive goods.

Retail Trade of Furniture, Home Furnishings and Equipment.

This land use is found in six blocks scattered across the CBD. Five of the blocks are in the fringe of the CBD area, and one is in the center. The blocks are H, J, O, P, S and T (Map 20). The maximum Lq value for this land use is 60.37. Block H displays a few isopleth lines occurring in concentric circles along the side facing Broadway Street. This block has an isoline with Lq value of 16.5. The block has one store which sells equipment and household appliances. Block J also has one store dealing with the sale of household appliances. The isopleth lines are closely spaced, showing intensity of this land use, and

Retail Trade: Furniture, Home Furnishings



0 150 300 600 900
Scale in Feet

Rina Ghose

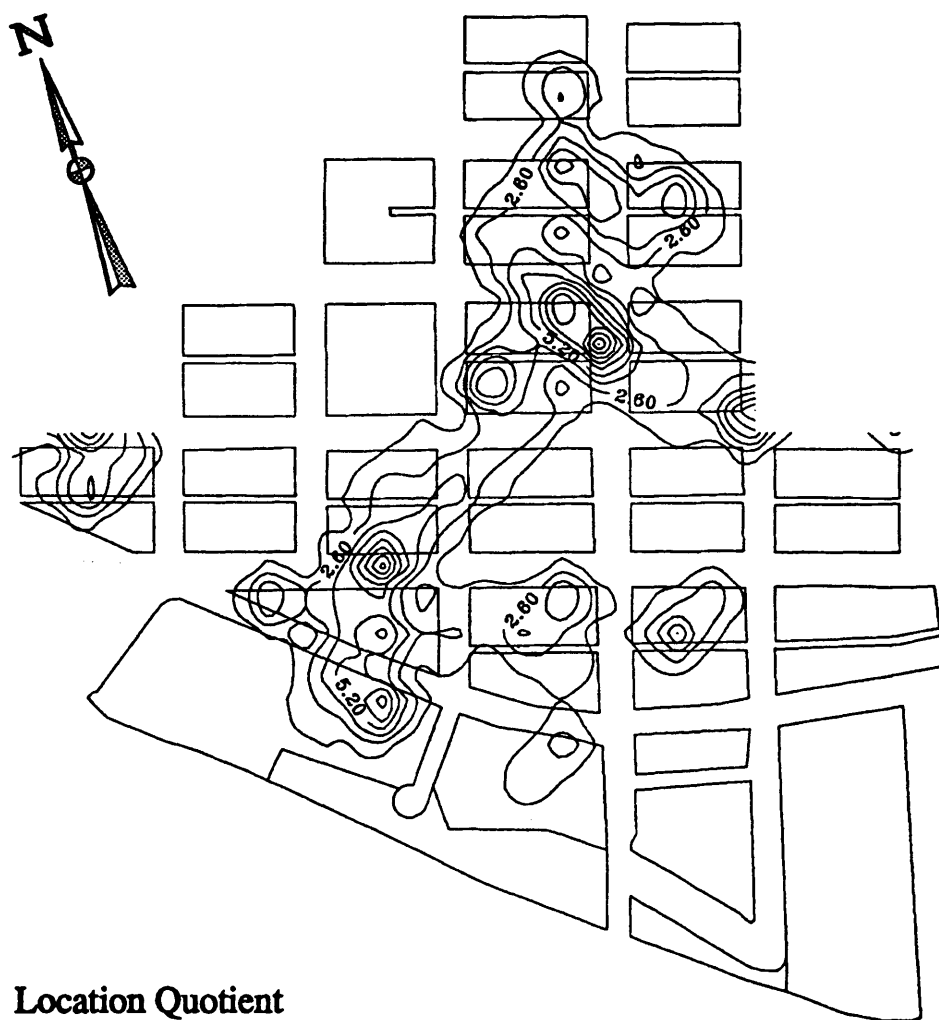
isoline of 49.5 forms a peak value. Block O contains a shop dealing with home furnishing articles; a few isopleth lines pass through this block, with the highest Lq value of an isoline being 16.5. Block P shows a heavy cluster of isopleth lines, displaying a peak Lq value of 44. The presence of a large store dealing in household appliances is responsible for this high Lq value. Block S has a large furniture store, which has caused the formation of a thick cluster of isopleth lines, with a high Lq value of 33. Block T possesses one small-sized furniture store, the presence of which produces a Lq value of 11.

As noted, most of the stores displaying this particular land use happen to be located toward the fringe of the CBD. One reason for this is that furniture, home furnishings and such items are not so dependent on pedestrian traffic as the retail trade of apparel is. These stores could afford to locate in two or more blocks farther away from the PLVI in order to obtain less expensive land. Most of these stores lie along or near Front Street, along which business has developed for a considerable distance. Such stores seem to have become located in proximity to glass stores, building materials stores, repair stores, etc.

Retail Trade of Eating and Drinking. Compared to most this is a relatively ubiquitous land use. It is found over blocks scattered throughout the central part of the CBD.

The maximum Lq value is 13.25. Blocks A, D, E, H, I, J, L, M, P, Q, R and T display this particular land use (Map 21). Block A has two small eating places and has a few isopleth lines passing through it; the highest Lq value of isolines is 2.8. Block D has four small- to moderate-sized eating and drinking places and has its highest Lq value of isolines at seven. Block E shows three small-sized eating and drinking places and has its maximum Lq value at 5.6. Block H shows a high concentration of isopleth lines, with the highest Lq value of the isolines lying at 12.6. This block contains two large drinking places and one moderate-sized restaurant. Its proximity to the PLVI could have encouraged such intensive use of urban area for eating and drinking purposes, a trade which does depend on pedestrian traffic to a certain extent. Block I contains three eating and drinking places, and the isoline with the highest Lq value is seven. Block J shows a fairly high cluster of isopleth lines, caused by the location of one large eating place; its isolines peak at 8.4. Block L contains three moderate-sized eating and drinking places; its highest Lq bearing isoline is 9.8. Block M has three smaller eating and drinking places, which have given rise to isolines with Lq values of 2.8. Block P has several isopleth lines traversing it, caused by the presence of two eating and drinking places. The highest Lq bearing isoline found here is 5.6. Block Q has six small-sized eating and drinking places, with the

Retail Trade: Eating and Drinking



Location Quotient
Interval = 1.3

0 150 300 600 900
Scale in Feet

Rina Ghose

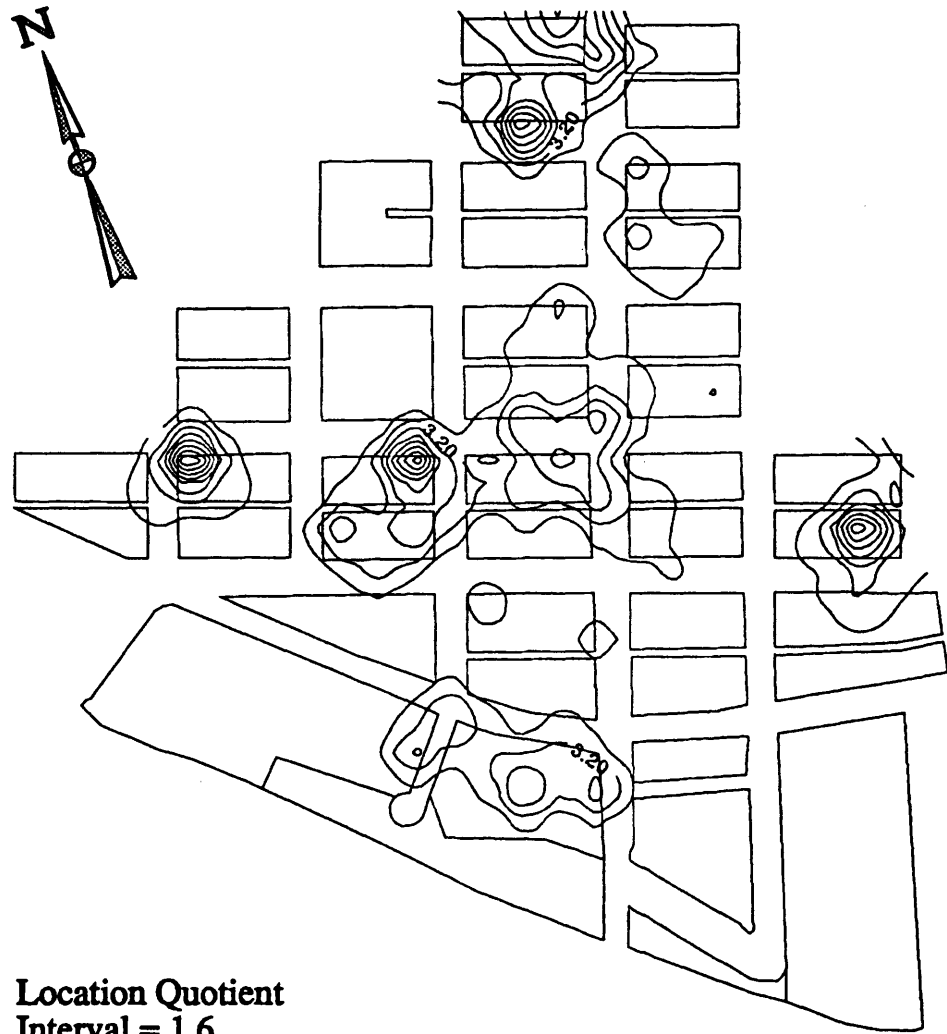
Map 21

majority of these being bars. The isolines rise up to 4.2. Block R has two moderate-sized dining establishments, and has isolines with a high Lq value of 5.6. Block T has five eating establishments, which has caused the isolines to display Lq values up to 8.4.

An examination of the map reveals that the blocks along Higgins Avenue and Front Street show the largest concentration of eating and drinking establishments. Again, this could be due to the high volume of traffic along these two streets, much of which consists of pedestrians. Obviously this brings a considerable number of potential clients to these places. In addition, all of these establishments happen to be located in blocks with either retail stores or offices. Many of the offices house professional people involved in service-oriented activities. Both the retail stores and the office buildings bring a large number of customers to these dining and drinking places, causing the popularity of these blocks to rise for such types of business.

Other Retail Trade. This includes a variety of different types of retail trade which have been listed on page 48. These are found in blocks A, E, H, I, K, L, M, N, O, Q and T (Map 22). The maximum Lq value for this land use is 16.32. Block A displays a large number of isopleth lines, indicating a high intensity of this land use, and the

Other Retail Trade



Location Quotient
Interval = 1.6

0 150 300 600 900
Scale in Feet

Rina Ghose

Map 22

isolines rise up to twelve. This block has seven stores conducting retail trade activity. These include four pawn shops, one shop selling second-hand merchandise, one liquor store and one pharmacy store. Block E contains one pawn shop and two sporting goods stores; it has an isoline with L_q value of three. Block H, with a higher intensity of other retail trade use, has its isolines peak at six. It contains a stationery and book store, a drug store and a sporting goods store. Block I has a lower intensity of this type of land use, having one jewelry shop and one general merchandise shop, and its highest isoline is three. Block K has a large thrift shop, which produces a dense formation of concentric isopleth lines. The highest isoline is 13.5. Block L displays a thick concentration of isopleth lines with a maximum isoline of 13.5. This block has two large bookstores, an import market and a pawn shop. Block M also has several stores with this type of trade, one gift store and one book store; its maximum isoline is six. Block N has a jewelry store, a liquor store and a book store; it has an isoline of 1.5. Block O has a heavy cluster of isopleth lines, showing high intensity of land use, and the lines rise up to a L_q value of twelve. The block has a sporting good store, an antique goods store, and a novelty store. Block Q has several stores with this type of activity, but all of them are small in size. Consequently, this block does not show a high intensity of this type of land use. The

stores include an antique store, a sporting goods store, a photographic supply store, two gift stores, and a jewelry store. However, the isoline with the highest Lq value is only 1.5, since none of these stores occupies much floor space. Block T also has several stores with retail trade activities, such as a sporting goods store, a florist's shop, a souvenir store, a jewelry store and a book store. Isolines have risen up to six.

Analysis of the map shows that a large number of the stores are located along Higgins, Front, and Broadway, three of the busiest streets in the CBD, in order to benefit from the high volume of pedestrian traffic in these areas.

In general, the retail trade activities appear to be the second most important one in the Missoula CBD. The retail trade of eating and drinking is the most highly represented, followed by the retail trade of miscellaneous types. These two are also the most widespread throughout the CBD. The retail trade of apparel and accessories remains concentrated around the Higgins Avenue and the PLVI. Other types of retail trade are of lesser importance.

Services Land Use. In the Missoula CBD, the following categories of services have been found:

1. Finance, Insurance and Real Estate. Banking and bank-related functions, credit services other than banks, security and commodity brokers, dealers, exchanges and

services, insurance carriers, agents, brokers and services, real estate and related services, holding and investment services, other finance, insurance and real estate services collectively comprise this activity.

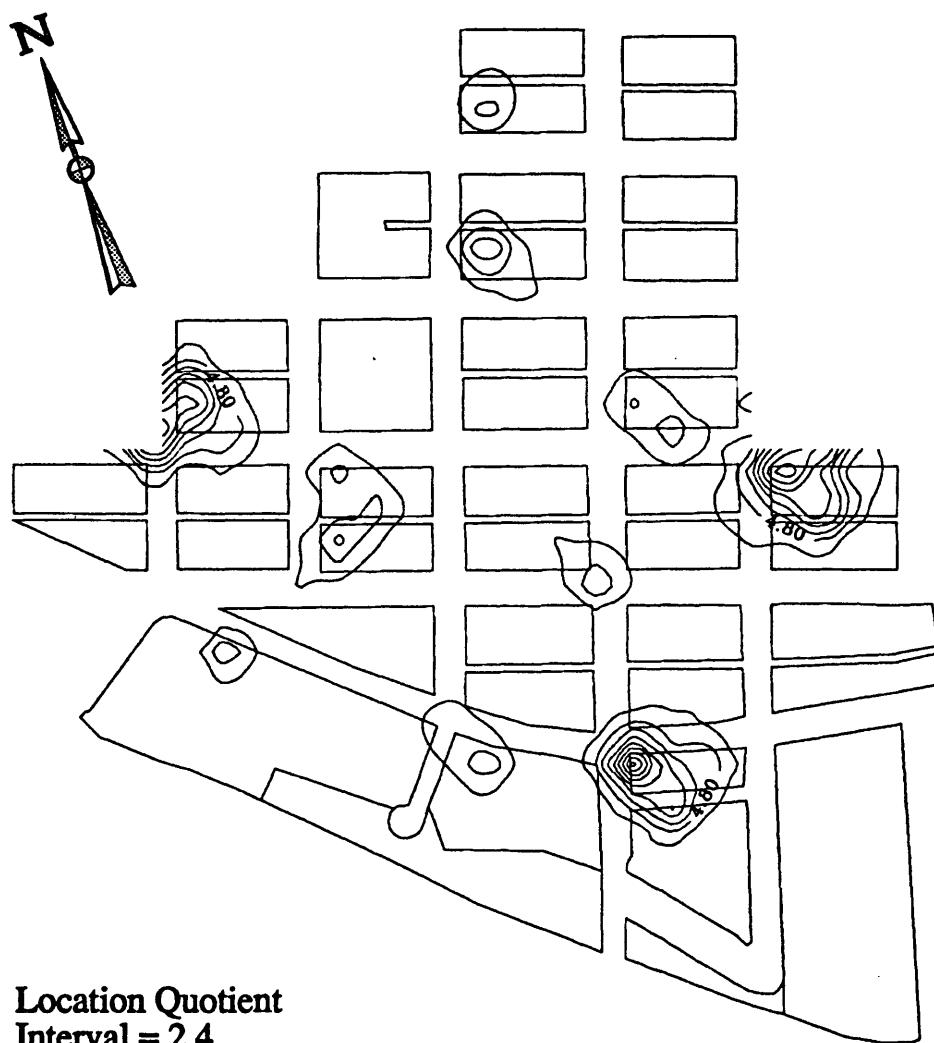
2. Personal Services. These include laundry, dry cleaning and dyeing services, photographic services, beauty and barber services, funeral and crematory services, apparel repair, alteration and cleaning pickup services, shoe repair services and other personal services.
3. Repair Services. The classification contains automobile repair and services, in addition to other repair services.
4. Professional Services. These comprise medical and other health services, legal services, other professional services including engineering and architectural services, educational and scientific research services, accounting, auditing and bookkeeping services and urban planning services.
5. Governmental Services. This consists of executive, legislative and judicial functions, protective functions and their related activities, postal services, correctional institutions, military bases and reservations.
6. Educational Services. The subcategories include nursery, primary and secondary education, university,

college, junior college and professional school education, special training and schooling including vocational or trade schools, business and stenographic schools, barber and beauty schools, art and music schools, dancing schools, driving schools and correspondence schools.

7. **Miscellaneous Services.** These consist of religious activities, welfare and charitable services, other miscellaneous services such as business associations, professional membership organizations, labor unions and similar labor organizations, civic, social and fraternal associations.

Finance, Insurance and Real Estate Services. The maximum Lq value for this category is 22.76. This activity is found in several blocks spread over the CBD. The blocks are A, D, F, I, L, M, O, T, and U (Map 23). In block A, only a single isopleth line is found due to the presence of Missoula Federal Credit Union, and the Lq value of the line is 2.5. Block D displays a few isopleth lines caused by the presence of a real estate office and the Credit Bureau; the highest isoline for this block is 7.5. Block F shows a heavy concentration of isopleth lines, indicating high intensity of this land use. The highest isopleth line is 17.5. This is due to the location of a large bank and an insurance office in this block. Block I has banking services and has

Services: Finance, Insurance, Real Estate



Location Quotient
Interval = 2.4

0 150 300 600 900
Scale in Feet

Rina Ghose

a maximum Lq value of five. Block L has an office offering insurance services and displays a maximum Lq bearing isoline of five. Block M contains the Bank of Montana and its isolines rise up to five. Block N and O both have banking services. Block N has a smaller one and block O has a large-sized bank. As a result, the isopleth lines start from N and concentrate heavily on O. Isopleth line five touches block N, whereas in O, the lines peak at 20. Block Q has two small offices providing insurance and investment services, and the isopleth lines just touch this block. Block T has several insurance and investment offices and has an isoline of five. Block U has the First Interstate Bank, which has caused the formation of closely spaced concentric circles of isopleth lines, with a peak value of 22.5.

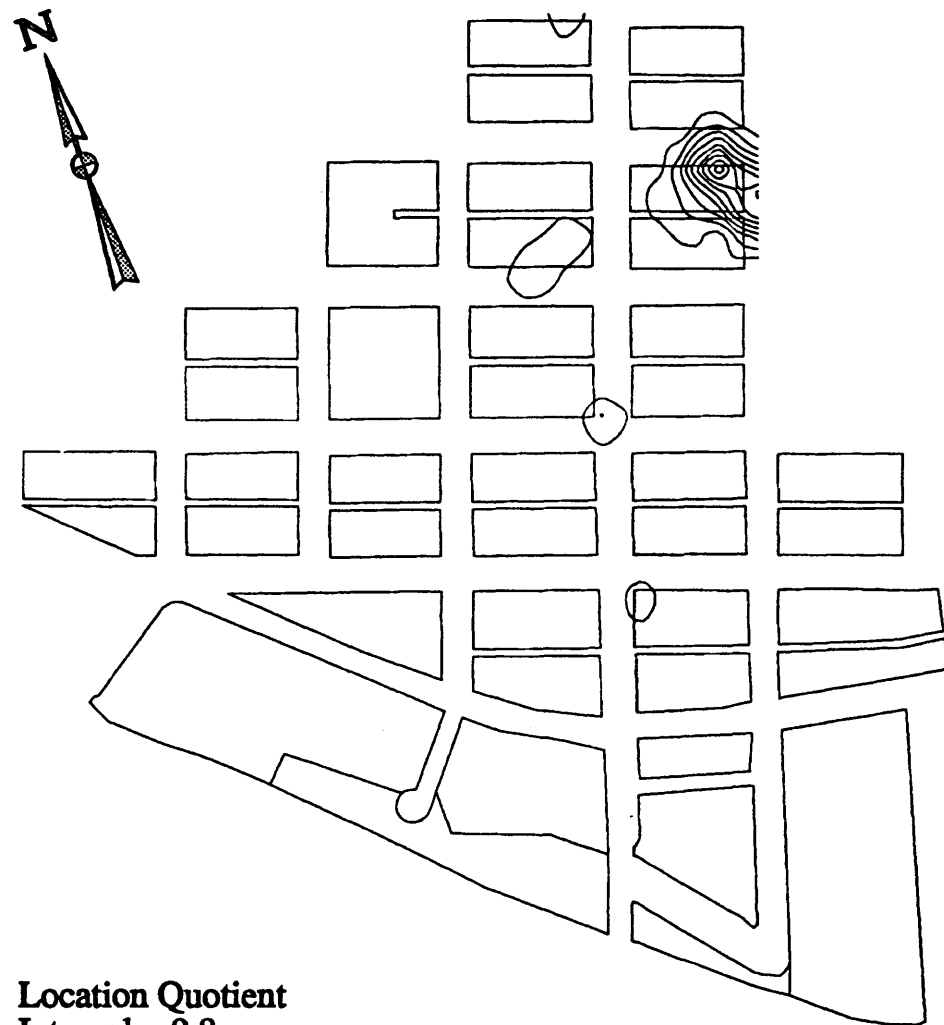
Inspection of the map discloses that these services are found dispersed throughout the entire CBD. The highest intensities of land use are found to be caused by large banks and savings and loan institutions, which occupy large areas and often have several floors. These financial institutions are all found to lie a few blocks from each other. Perhaps this was not intentional, in fact it seems more probable that these financial institutions were developed in locations where a large amount of land was available for parking and drive-up facilities. Thus, they occupy the fringe areas of the CBD core. The banks are also on the busiest streets of Missoula CBD, i.e. Broadway, Main,

and Front, and are easily accessible to clientele. Credit services and insurance and investment offices are all found to be scattered throughout the CBD. Block T is noted to have several investment and insurance offices, possibly because it is along West Front Street, which has a high traffic volume and easy access.

Personal Services. There are five occurrences of personal services land use in the CBD. These appear in blocks A, D, E, H and R (Map 24). The maximum Lq value for this land use type is 98.6. This high Lq value is caused by a low amount of total land area in the CBD being devoted to personal services. In block A, a small barber shop is found, giving rise to isolines with a Lq value of ten. Block D contains two stores providing tailoring services and has isolines reaching up to ten. Block E shows a high intensity of land use of personal services type, with closely spaced isopleth lines forming a thick cluster, forming a high of 90. The presence of a large laundry is responsible for this high Lq value. Block H shows its highest isoline to be 20, caused by the presence of a hair salon. Block R also has a hair salon and has a Lq value of ten.

An analysis of the map shows that the more utilitarian types of personal services, such as laundry or a low-cost barber shop or tailoring services, are located on the fringe of the CBD where the land values are lower. The more

Personal Services



Location Quotient
Interval = 9.8

0 150 300 600 900
Scale in Feet

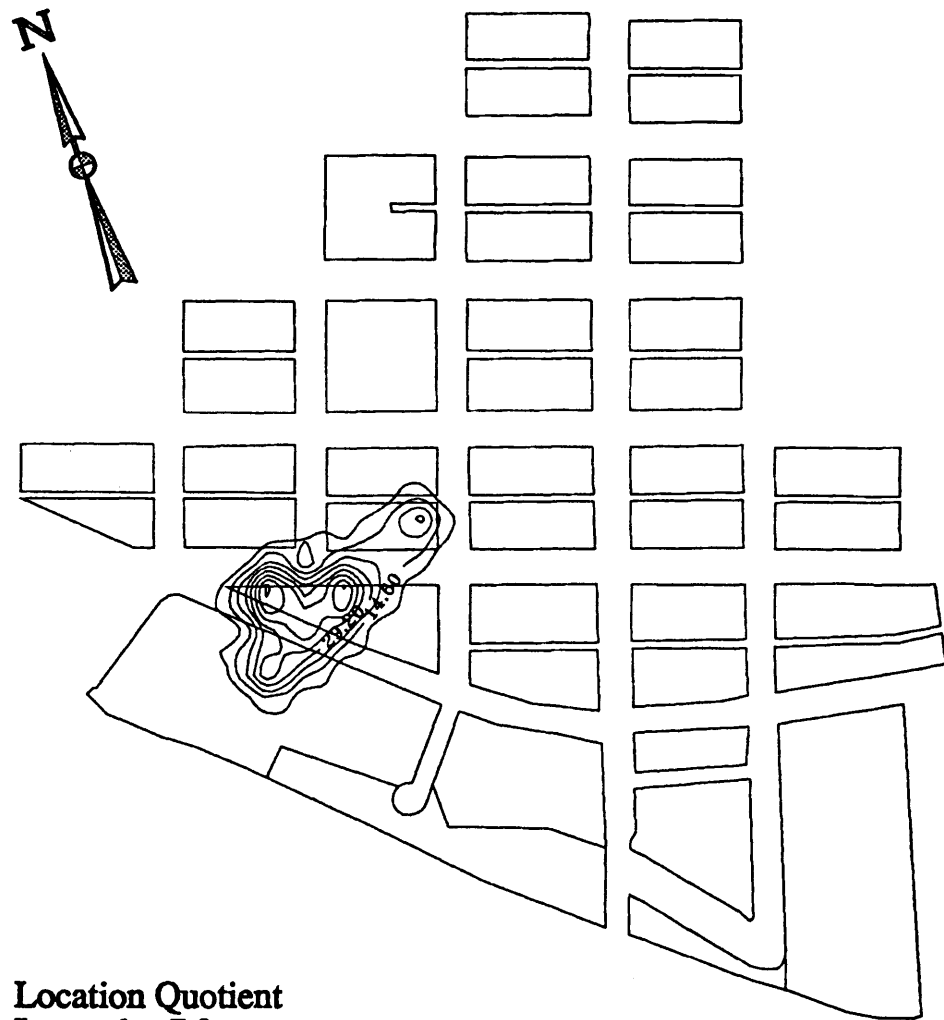
Rina Ghose

expensive types of services, such as fashionable hair salons, are located in the costlier blocks which contain other expensive retail stores and are close to the pedestrian traffic along Higgins and Broadway. The clientele visiting the more expensive boutiques along this area are quite accessible to the salons located in these two blocks. Another noticeable feature is that virtually all of these land uses are located along Higgins.

Repair Services. This type of land use is found in two blocks, L and P, and the low number of occurrences have resulted in a high degree of intensity of this land use, causing the maximum Lq value to be 72.98 (Map 25). Block L has a locksmith's shop, and its highest isoline is 30.5. Block P, on the other hand, exhibits a high degree of intensity of this type of land use, with closely spaced, concentric isopleth lines. This is caused by two types of repair shops (auto repair shop and radiator servicing shop) within this block, and the isolines rise up to 54.9.

These types of activities are minor in importance in the CBD and tend to occur in the fringe blocks. In the case of the repair shops in block P, their location in that block could have been influenced by the proximity of Orange Street, a major artery serving a large volume of vehicular traffic.

Repair Services



Location Quotient
Interval = 7.3

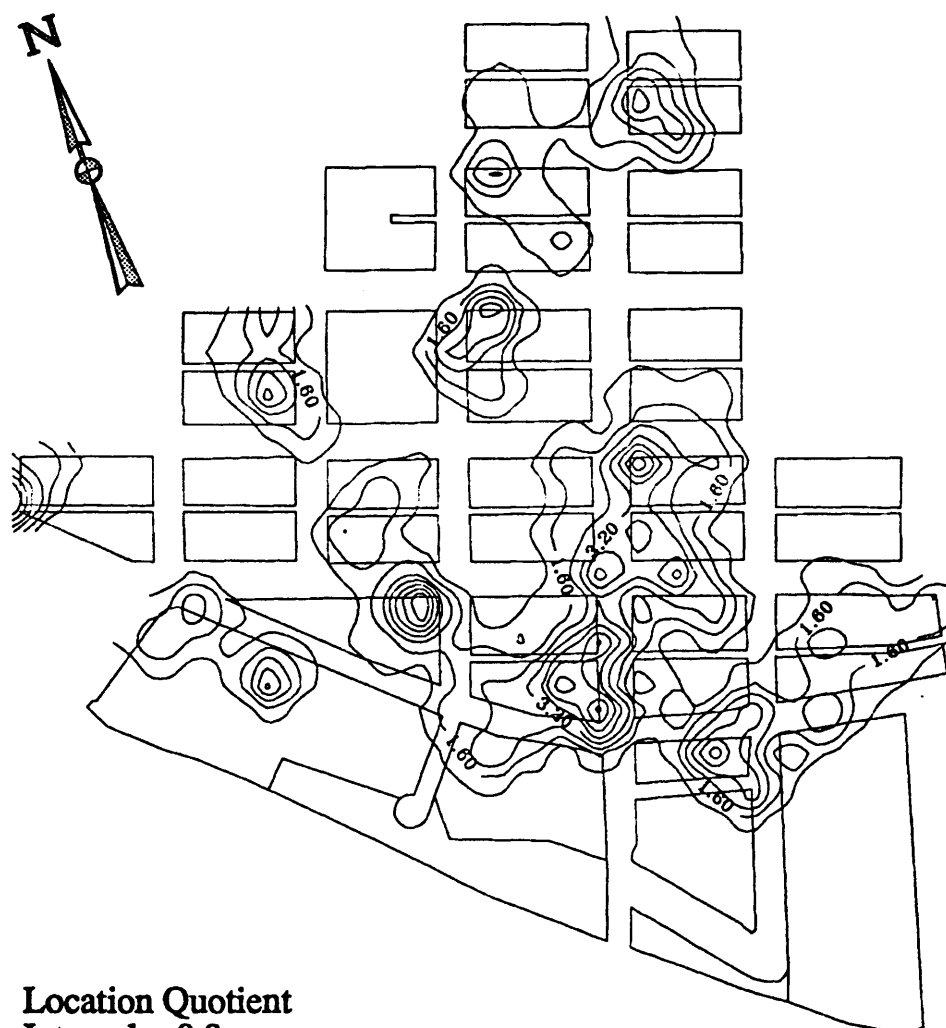
0 150 300 600 900
Scale in Feet

Rina Ghose

Professional Services. This is one of the most common land uses found in the CBD. It is seen in a large number of blocks, namely A, B, D, F, H, I, J, L, M, N, P, Q, R, S and T (Map 26). As a result of the high number of occurrences, the highest Lq value for this land use is only 8.17. Blocks A, B and D have law offices, offices for professionals, and a chiropractic clinic. The highest isoline for these blocks is 4.2. Block F, H and I have several offices dealing with law and other services and a chiropractic clinic; its highest isoline is 4.2. Block J contains a fairly large law office, which has caused its isolines to rise up to 4.9. Block L and M have law firms, as well as offices for professional services. Their highest isoline is 3.5. Block N and P display a high intensity of this land use, with several floors of office buildings devoted to professional services and law offices, respectively. The highest isoline for both of blocks is 6.3. Block Q has a large number of offices belonging to different professional services, such as legal, investment, etc.; its isolines form a high of 6.3. In blocks R and S, the highest isoline is 2.8, caused by some professional service-oriented offices. Blocks T and U have several office buildings with different types of professional activities, and the highest Lq bearing isoline is 4.9.

Even though professional services occur throughout the CBD, there tends to be a certain amount of centralization

Professional Services



Location Quotient
Interval = 0.8

0 150 300 600 900
Scale in Feet

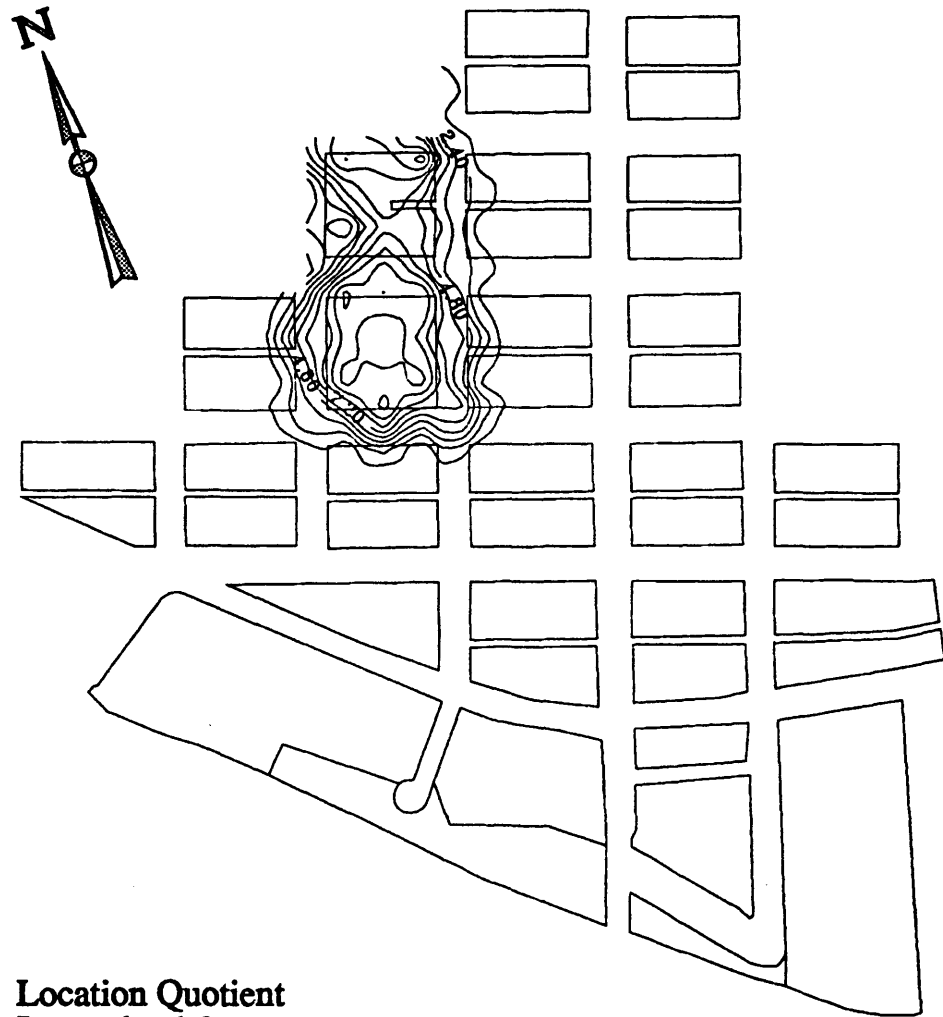
Rina Ghose

around the PLVI, a location which has the best accessibility and the greatest centrality in the CBD. In addition, this activity is also found to have greater concentration around the major streets of the CBD, namely Higgins, Main, and Front. Easy accessibility to these streets is certainly a factor that has contributed to such a concentration. In addition, the prestige of being located in more expensive areas close to the PLVI, along Higgins and Main, is also a strong influence in the development of such locations.

Governmental Services. This type of service occurs in two blocks in the CBD, blocks C and G (Map 27). The maximum Lq value for this land use is 11.88. Both of the blocks are used entirely for city and county governmental offices. Block C is the City Hall and contains the Police Service, the Office of Community Development, the Mayor's Office, City Engineering, several other city government offices and the Fire Services. Block G contains the County Court House, the jail and a few other county government offices. Isopleths are closely spaced and spread over these two blocks, showing the high intensity of governmental service type land use over these two blocks.

Perhaps the development of these two blocks into governmental service oriented types started with the historical location of the County Court House. The other functions were added later in the blocks G and C. It is

Government Services



Location Quotient
Interval = 1.2

0 150 300 600 900
Scale in Feet

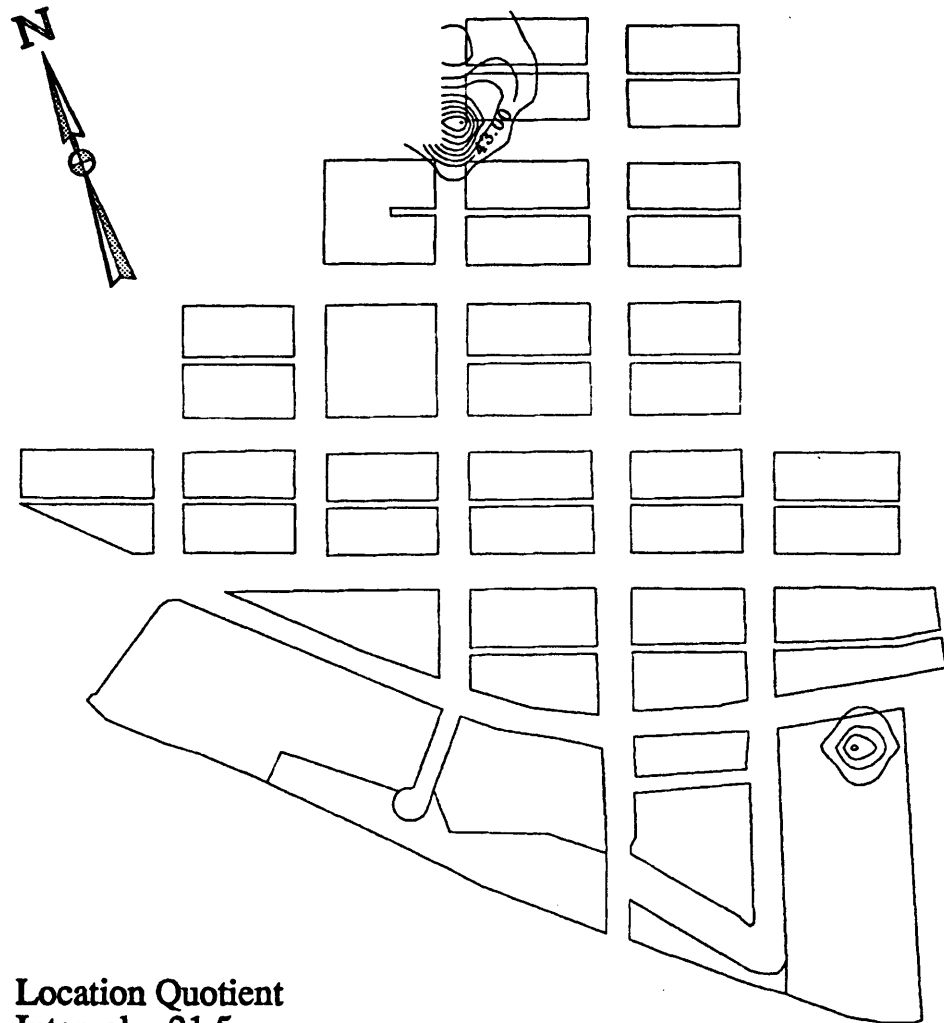
Rina Ghose

most likely that these functions were all located near each other for the sake of convenience.

Educational Services. There are only two occurrences of this land use, both of them small in area (Map 28). Consequently, the maximum Lq value is quite high, 228.64. Block A has the first occurrence, the Missoula County Extension Office, an office for educational services. Isolines at this location rise up to Lq values of 200. Block V has a dance school; the highest isoline there is 100. Both of these services appear in the fringe blocks of the CBD. The dance school might have been located in block V because of its proximity to a theater that lies next to it, perhaps affording thereby incidental exposure to prospective clients.

Miscellaneous Services. As noted on page 61, several different types of services are grouped together under this category. These services are found in blocks B, D, E, I, M, O, S and T (Map 29). The maximum Lq value for this land use is 47.48. In block B, the United Way, an office for a non-profit organization is found, which gives rise to isolines of 27. Block D contains the office of Missouri Basin Study Works, a non-profit organization, and its highest isoline is 13.5. Block E has a high intensity of this land use, with isolines rising up to 36, caused by the presence of Bike

Educational Services

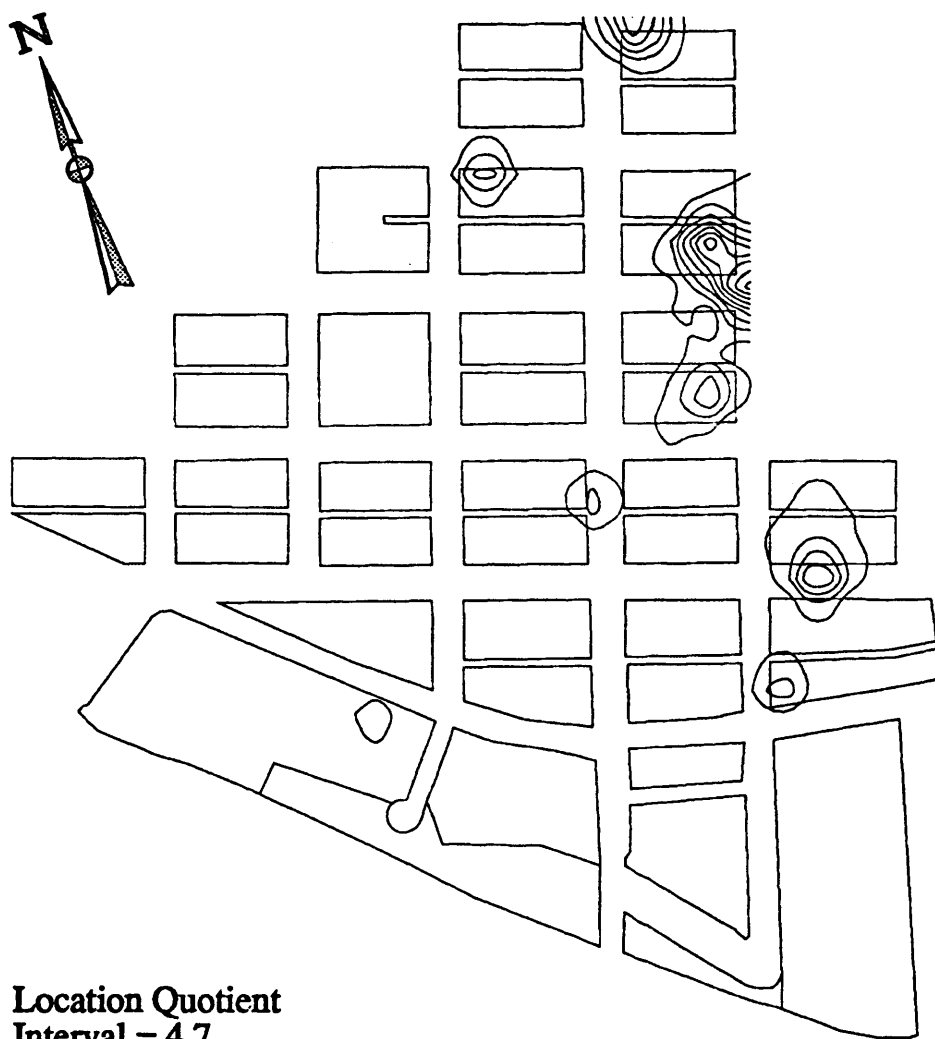


Location Quotient
Interval = 21.5

0 150 300 600 900
Scale in Feet

Rina Ghose

Miscellaneous Services



Location Quotient
Interval = 4.7

0 150 300 600 900
Scale in Feet

Rina Ghose

Travel Association, a non profit organization. Block I contains the meeting rooms of the Masonic Lodge, which has caused its isolines to rise up to a maximum of 18. In block M, a small number of isopleth lines are found giving rise to a high of nine. Block O contains the Union Hall, which has caused the formation of concentric isopleth lines with a peak value of 22.5. Block S has a lower intensity of this land use, with the highest isoline of 9, caused by the presence of The Elks' Club, a membership organization. Block T, with a small non profit organization, gives rise to a Lq value of 4.5.

Most of the offices used for such activities are found along the fringe of the CBD where land values are lower. These places do not rely on easy accessibility to pedestrian traffic. The clientele are more likely to make a trip by automobile for the sole purpose of visiting such establishments.

An overall analysis of service land use reveals that it has become the primary land use of the Missoula CBD. The professional services category is the most important one, and tends to be spread throughout the CBD, with concentrations in Higgins, Main and Front Street. Finance, Insurance and Real Estate is next in importance in the service function. Miscellaneous types of services are the third in importance. The rest are secondary, with the exception of the Government services, which form a strong

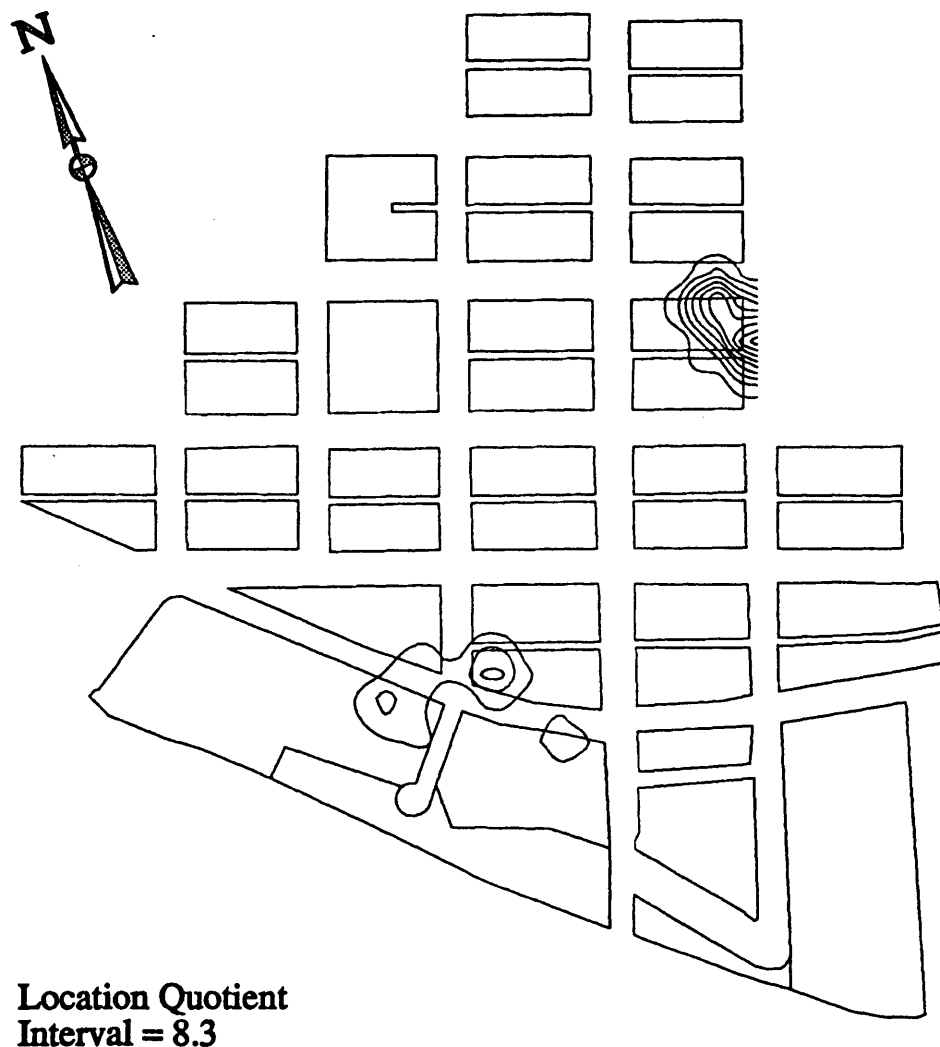
cluster in the western fringe area of the CBD.

Cultural, Entertainment and Recreational Land Uses. Land uses of this nature have been studied under the following subdivisions:

1. Cultural Activities and Nature Exhibitions. Cultural activities include libraries, museums and art galleries. Nature exhibitions include planetaria, aquariums, botanical gardens and zoos. Historic and monument sites are included as part of the other cultural activities.
2. Public Assembly. The class takes into account entertainment assembly (amphitheaters, motion picture theaters, drive-in movies, etc.), sports assembly (stadiums, arenas and field houses, race tracks, etc.), and public assembly (auditoriums, exhibition halls, etc.).
3. Parks. This includes parks for general recreation as well as parks for leisure and ornamental purposes.

Cultural Activities and Nature Exhibitions. This type of land use activity is found in four blocks in the CBD. The maximum Lq value for this land use is 83.44. Blocks I, P, Q and T display land use of this nature (Map 30). Block I displays closely spaced isopleth lines indicating high intensity of this land use, which is caused by the presence

Cultural Activities



0 150 300 600 900
Scale in Feet

Rina Ghose

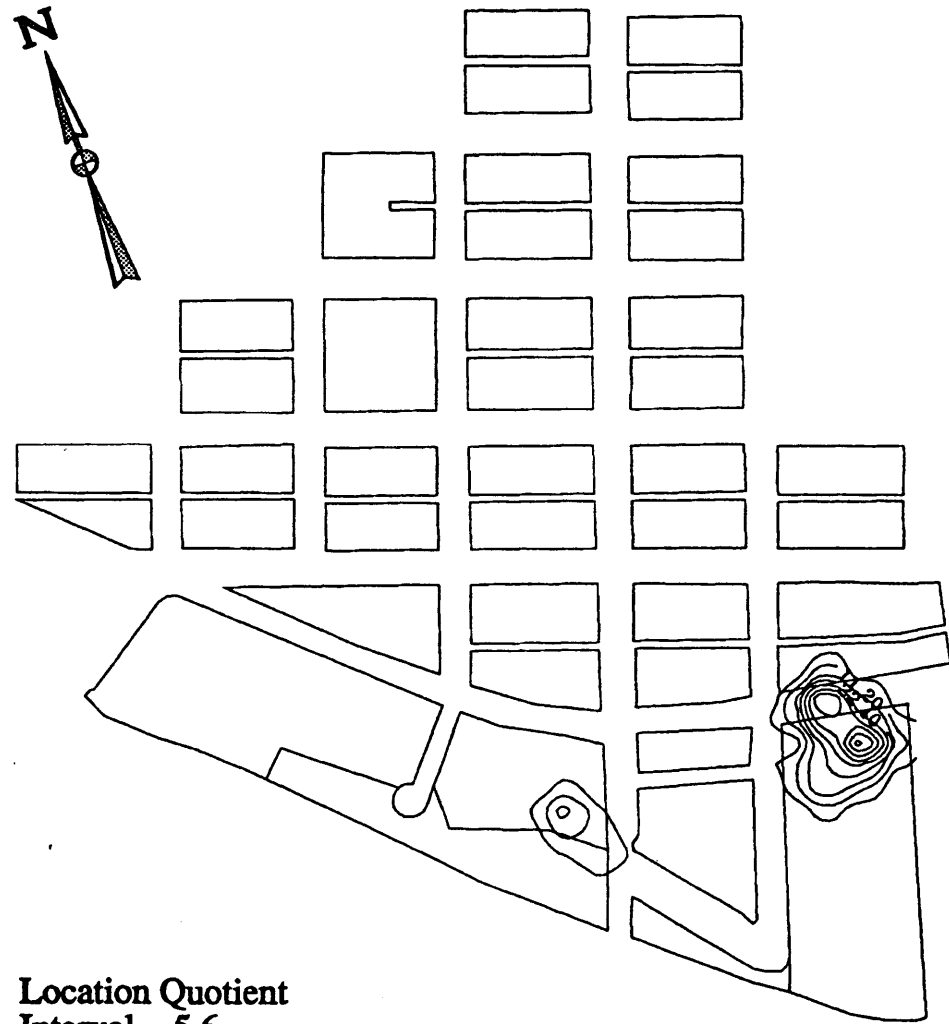
of an art museum. The isopleth line showing the highest value in this block is 72. Block Q contains an art gallery (Monte Dolack's) and displays an isopleth line of 24 as its peak value. Block T also contains an art gallery.

It is noticeable that the commercial art galleries are located along the Front Street and within half a block of Higgins Avenue. This location is obviously advantageous owing to the heavy pedestrian and vehicular traffic passing through these streets, which brings potential customers to the galleries. The art museum is located at a less accessible block, since it is not dependent on pedestrian traffic and art lovers are likely to make a special trip to the museum regardless of its location in the CBD.

Public Assembly. The maximum Lq value for this land use is 56.65. It is seen in blocks T and V (Map 31). Block T contains a multiple-screen movie theater (The Wilma) and has an isopleth line of 15.3 indicating the peak value. A theater is found in block V, which is marked by closely spaced isopleth lines, the highest of which is 47.7.

Entertainment functions are traditionally focussed in the CBD in larger cities, but in Missoula they have become decentralized and are found mostly outside the CBD. Current entertainment functions tend to cluster along Front Street and the part of the Higgins Avenue closest to the bridge.

Public Assembly



Location Quotient
Interval = 5.6

0 150 300 600 900
Scale in Feet

Rina Ghose

Parks. These are found all along the bank of the Clark Fork river, and are used for the purposes of recreation and beautification (Map 32). The closely spaced isopleth lines are uniformly spaced over the entire river front area. The maximum Lq value for this land use is 26.51.

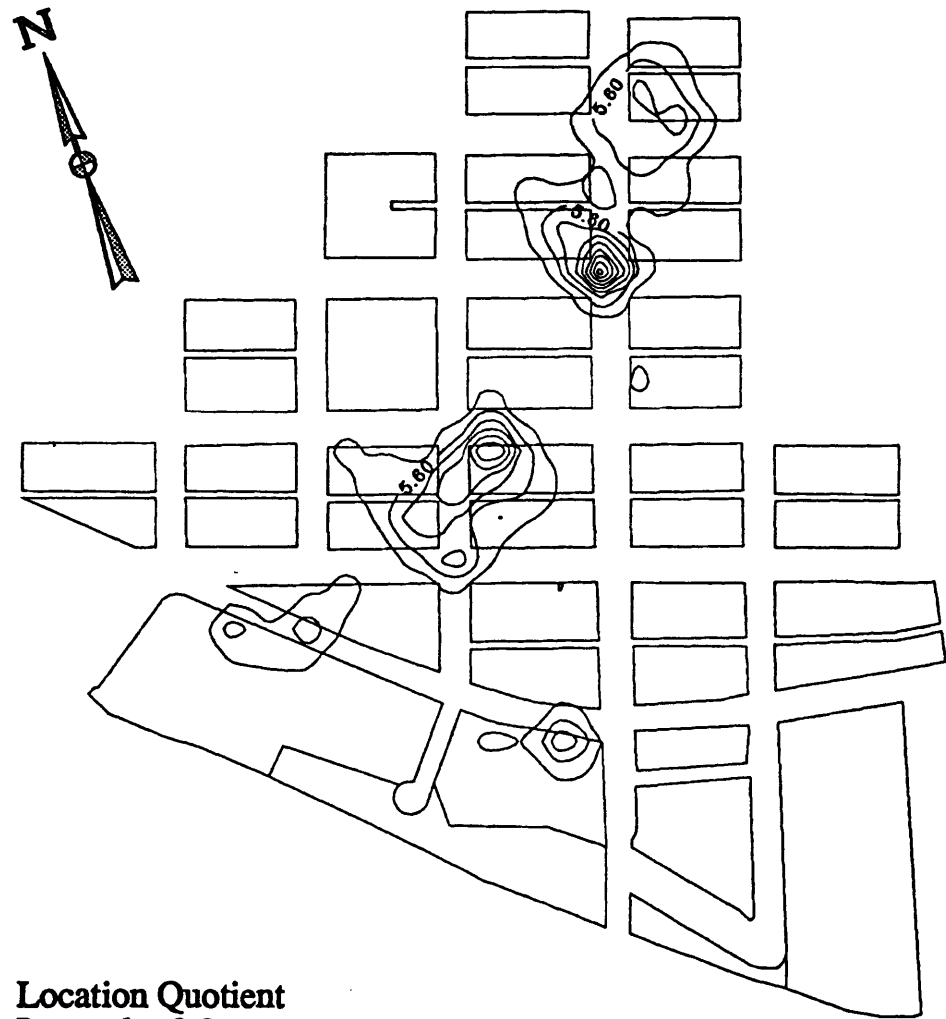
An overall analysis of the Cultural, Entertainment, and Recreational land use shows that the recreational land use is the most prominent one in the Missoula CBD due to a planned riverfront project. The Missoula River Front Project has been an ongoing project that has concentrated on beautifying the riverfront area by creating parks and open spaces. Cultural and entertainment functions seem to have shifted to other parts of Missoula, leaving a few behind in the CBD.

Undeveloped land and water areas. This land use has been studied under the following categories:

1. Vacant Floor Area.
2. Under Construction. This takes into account areas under construction for both residential and non-residential land uses.

Vacant Floor Area. Surprisingly, the CBD showed vacant floor areas in a number of blocks (Map 33). The maximum Lq value is 28.82, and these vacant floor areas are found in blocks B, D, E, H, I, L, M, P, Q and T. Block B displays

Vacant Floor Area



Location Quotient
Interval = 2.8

0 150 300 600 900
Scale in Feet

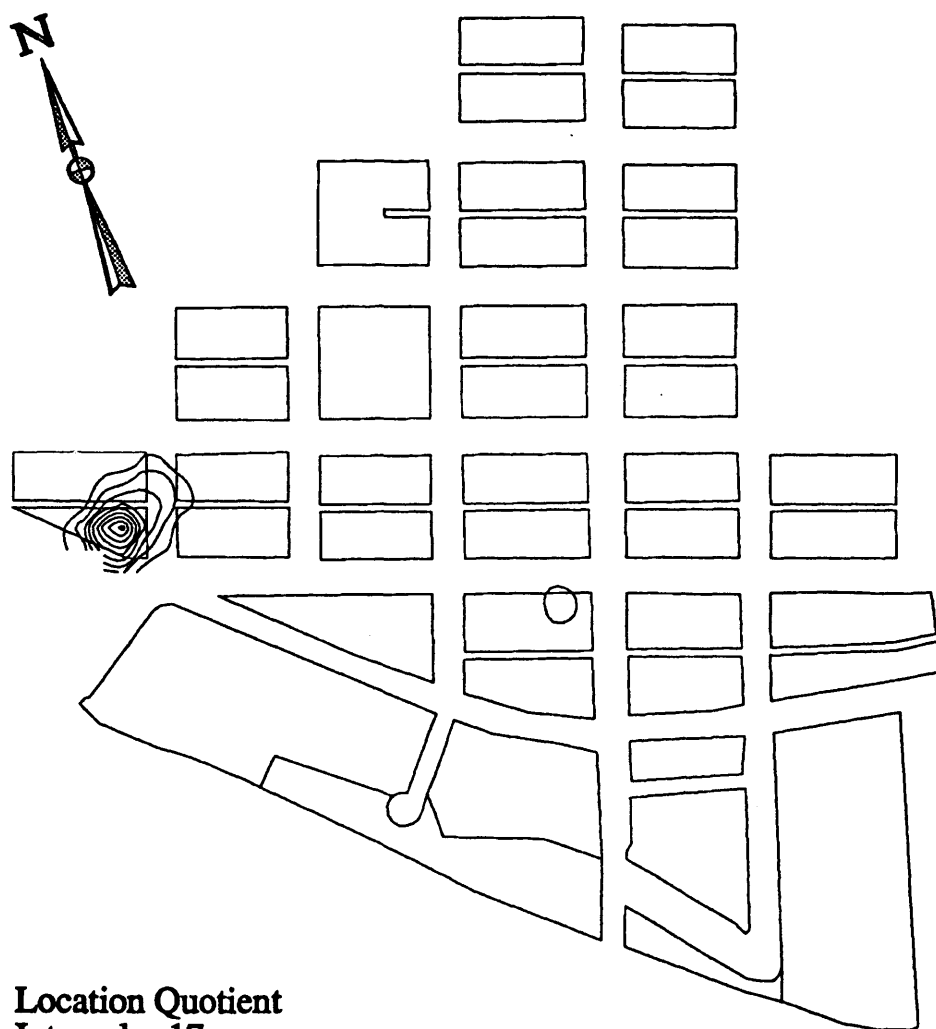
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the highest isopleth line to be 8.10. Block D has a higher area of vacant floor, as seen by the isopleth lines, which run up to 24.3. Block E also contains a smaller area of vacant floorspace, with isopleth lines running up to 5.4. Blocks H and I have very small floor areas lying vacant and have the isopleth line of 2.7 running through it. Blocks L and M have large areas lying vacant, with the isopleth line 10.8 touching block L and the 18.9 isopleth line forming a peak in block M. Block P has the isopleth line of 5.4 going through it. Block Q has a very small vacant floor area. Block T has the isopleth line of 8.1 running through it.

Although the CBD showed a number vacant areas at the time of the study, these vacancies were likely to be transitional in nature. Vacancies usually occur when a business closes up and the new business is yet to start. At the time of writing of this thesis, the researcher found many of these vacancies to be occupied once again with new businesses.

Area Under Construction. At the time of the land use survey, the CBD had two blocks with areas under construction (Map 34). Block J had a large area under construction, creating an isopleth line of 144 as a peak. Block Q had a small area under construction with an isopleth line of 16 running through it. Overall, the maximum Lq value for this land use is 179.98.

Area Under Construction



Location Quotient
Interval = 17

0 150 300 600 900
Scale in Feet

Rina Ghose

Although the CBD displays a few blocks with vacant areas or area under construction, these are usually temporary in nature and do not remain vacant or undeveloped for long.

Conclusion. The isopleth maps of the Lqs of the different land use activities were useful in displaying the concentration and the intensity of these activities over the blocks of CBD. Although regions of land use could be guessed at from these maps, they could not be properly defined and understood. The next chapter introduces and discusses the regionalization of the Missoula CBD through which different land use regions were created.

CHAPTER IV

REGIONALIZING THE LAND USE OF MISSOULA CBD

Introduction. The term region is defined as "a unit area of the earth's surface differentiated by its specific characteristics."³¹ It is also defined as

an area in which accordant areal relations produce some form of cohesion. It is defined by specific criteria and is homogeneous only in terms of these criteria.³²

A major characteristic of a region is its homogeneity.³³ Identification, classification and analysis of regions are important parts of geographical concepts. James and Jones define regions as belonging to three fundamental types:

- 1) those defined in terms of single features;
- 2) those defined in terms of multiple features;
- 3) those defined in terms which approach the totality of the human occupancy of area.³⁴

Regions are classified into two major types, formal and functional. A formal region is a "unit area with a certain uniformity of characteristics, in contrast to a functional

³¹ F. J. Monkhouse, A Dictionary of Geography, (London: Edward Arnold Ltd., 1965), 257.

³² Preston E. James and Clarence F. Jones, American Geography: Inventory and Prospect (Syracuse: University Press, 1959), 32.

³³ H. J. DeBlij and Peter O. Muller, Geography: Regions and Concepts, 6th ed., (New York: John Wiley and Sons, 1991), 3.

³⁴ James and Jones, American Geography, 35.

region, characterized as a sphere of activity."³⁵

According to De Blij and Muller, functional regions may be

conceptualized as spatial systems--such as those centered on an urban core, an activity node, or a focus of regional interaction--[these] are identified collectively as functional regions.³⁶

A formal region is viewed more as a static, uniform region, whereas a functional region is seen as a dynamic and flexible region, "continually shaped by forces that modify it."³⁷

In the opinion of De Blij and Muller, regionalization is a common process of classification followed by geographers.³⁸ Regional study can be accomplished by expository methods, by statistical methods, by cartographic methods, and by photo-interpretation methods.³⁹ In this chapter, the CBD of Missoula has been regionalized statistically and cartographically into eight major classes of land use and then analyzed.

The Regionalizing Process. The moment had arrived to determine regional patterns of the various land uses throughout the CBD. However, two problems were encountered.

³⁵ Monkhouse, A Dictionary of Geography, 130.

³⁶ De Blij and Muller, Geography, 3.

³⁷ Ibid.

³⁸ Ibid, 2.

³⁹ James and Jones, American Geography, 59.

First, the land use data were found to exist in thirty land use categories, a number far too large for analyzing regions and in need of simplification. Second, the data had thus far been analyzed in the form of location quotients. Lq values were ideal for depicting the concentration of activities over the CBD in the form of isopleth lines; yet they were highly unsuitable for regionalization, as they were not comparable. It was found that the lesser the occurrence of a land use activity over the CBD, the greater was its Lq value and vice-versa. This did not mean that an activity with a high Lq value was more important than that with a low Lq value. It merely meant that the activity with a high Lq value for a certain grid cell had a high share of that activity in that cell.⁴⁰ Lq values were not suitable variables upon which the regionalization process could be based. The solution was to normalize this data and make it comparable.

The objective was to derive a method of normalization, based upon which the data could be compared and regionalized. In addition, there was also the aim to simplify the thirty land uses into fewer numbers. The first goal was met when standard deviations for each land use type were considered as a suitable normalizing process, based upon which the data could be compared. It was recognized

⁴⁰ Refer to p.30-32 in Chapter II for a more detailed discussion.

that the standard deviation values of each land use would vary from all others, but that the deviations would still be comparable with each other and with the mean of each land use value.

The next step involved the calculation of the standard deviation of the different land uses. The spreadsheet in Excel was used for this purpose. (See p.27.) The spreadsheet was arranged so that each grid cell contained a Lq value for each land use activity. The mean value for each activity was also obtained and the standard deviation for each land use was calculated. Thus, for each grid cell, it was easy to calculate which land use activity had the highest standard deviation value above the mean. The land use containing the highest standard deviation above the mean was seen to be the "leader" over other land uses for that grid cell. In this manner, leading land use activities were found for all of the grid cells.

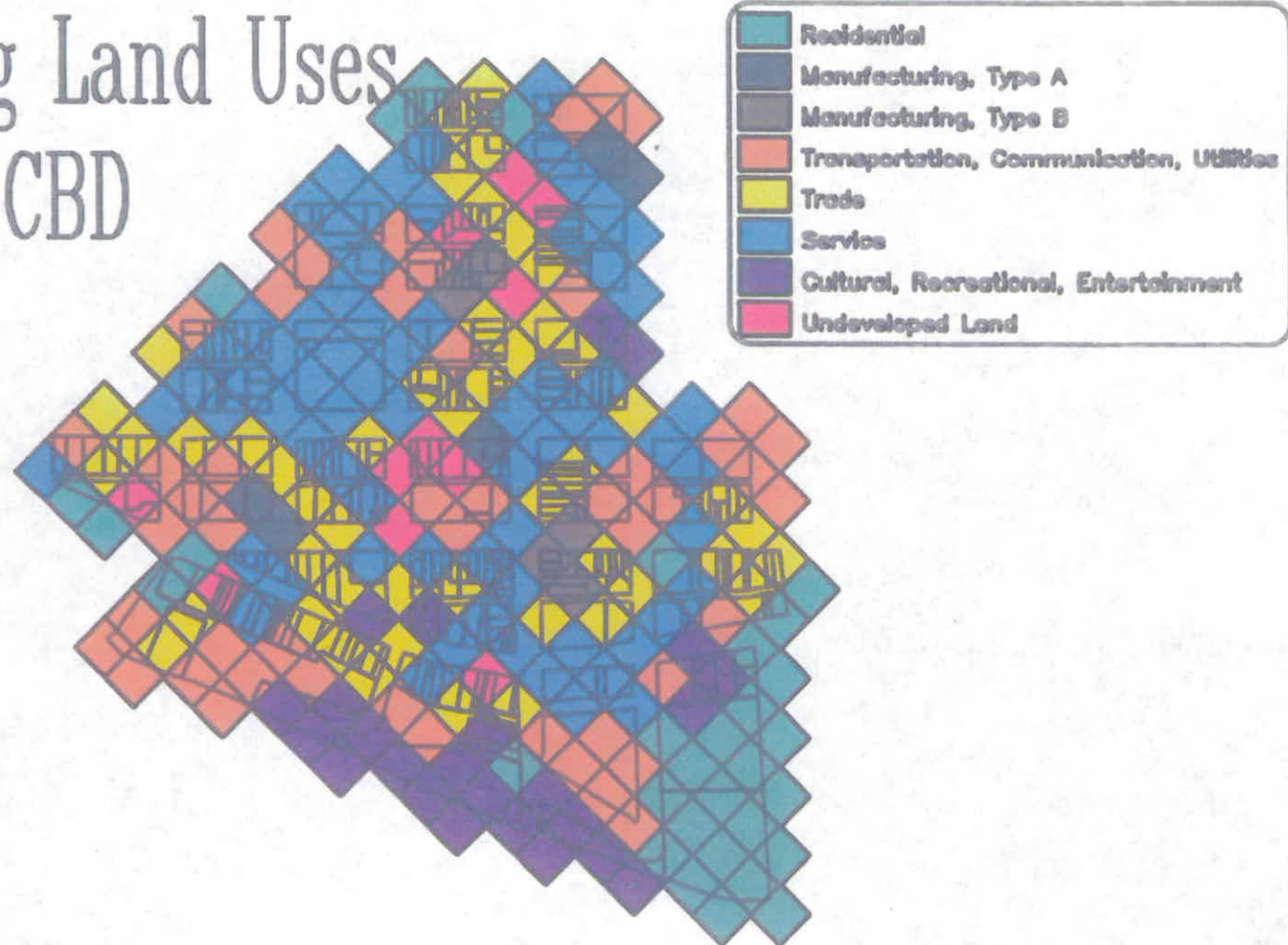
The next step was to classify all of the thirty land uses into broader divisions. Classification has been defined as

the systematic grouping of objects or events into classes on the basis of properties or relationships they have in common. Classification must follow a definite plan and the grouping can be accomplished by two routes: by logically subdividing a population, or by agglomerating like individuals.⁴¹

⁴¹ Ronald Abler, John S. Adams and Peter Gould, Spatial Organization, (NJ: Prentice Hall Inc., 1971), 151.

In this instance, the decision was to "agglomerate like individuals." The classification of land uses devised by the Standard Land Use Coding Manual had followed the concept of using digits for each level. Thus the first level showed the use of a single digit number and contained the broad subdivisions of land use. These are residential, manufacturing (which has been described and listed in two separate categories), transportation, communication and utilities, trade, services, cultural, entertainment and recreational and undeveloped land and water areas. Each of these has further subdivisions which lead to the use of second digits. To this point in the thesis, the second digit land uses had been used since they were considered to produce greater detail. Now it was necessary to revert to the first digit level, by considering the first number of the two digit code and assigning the code to the actual type of land use that the code depicts. Eight major classes of land uses mentioned previously in the paragraph were found for the Missoula CBD, and a map was drawn where the grids were colored according to the land uses which had the highest standard deviations above the mean value of location quotients (Map 35). In this thesis, such land uses have been referred to as the "leading land uses." The map displaying the grid cells with the leading land uses draped over the CBD blocks, indicates that definite regional patterns of land use exist over the Missoula CBD (Map 35).

Leading Land Uses in the CBD



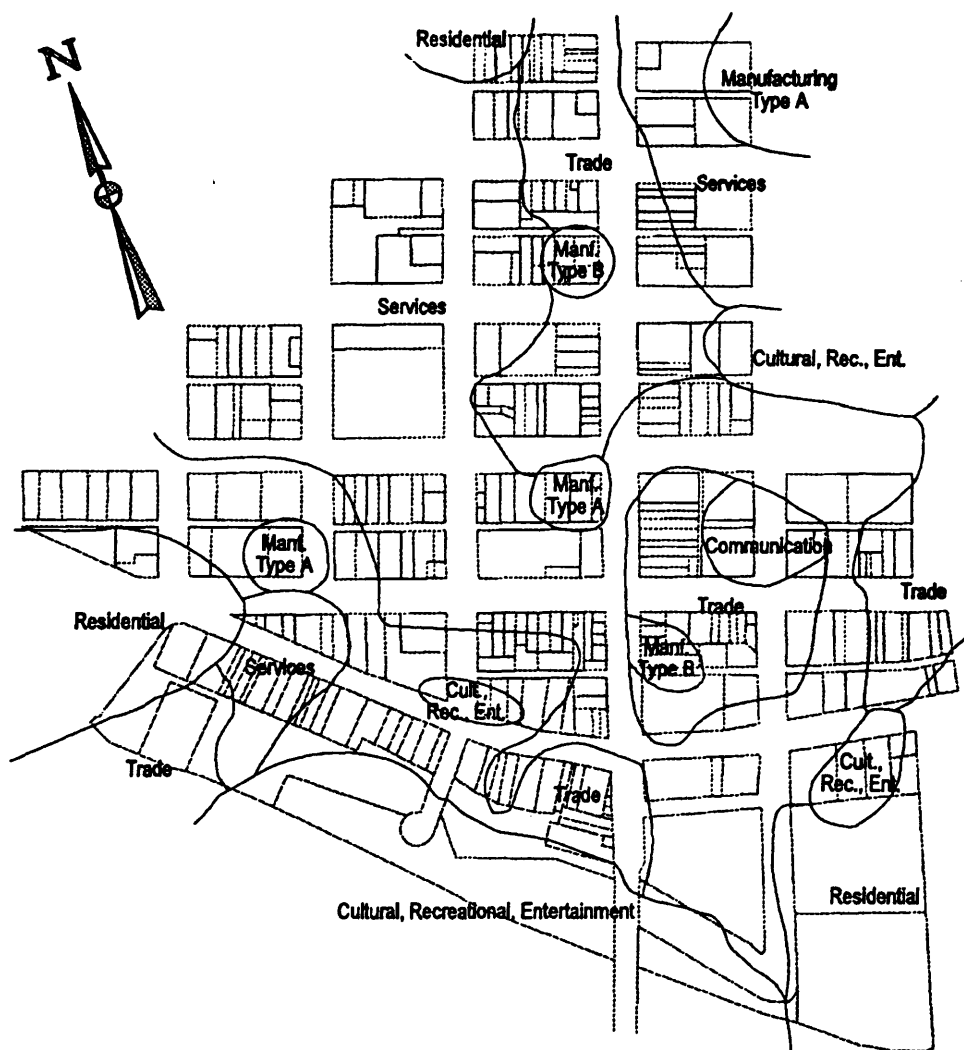
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This map helped to create the major regions of land use displayed in Map 36 and discussed later in the chapter.

Studying the patterns of leading land uses in the CBD in Map 35, one notices that transportation and communication land use are the most wide-spread ones and do not form a highly distinct pattern. This has occurred due to the presence of parking facilities all over the CBD that exist primarily to serve other land uses. Moreover, the distribution of undeveloped land areas appears to follow no pattern, and seems, rather, to be the result of accident. In consequence during the regionalizing process of CBD transportation and undeveloped land areas have not been included (Map 36). Communication land use is included as a region, even though it falls under the transportation and communication land use category. A large office building belonging to the Mountain Bell Telephone Company is found in the CBD.

Major Regions of Missoula CBD. In order to define the regional boundaries over the CBD, the patterns of leading land uses in Map 35 were studied. It was decided that in order to be considered a region, a land use had to occupy at least two adjacent grid cells. Lines were interpolated between the grid cells and were drawn to depict regions with the dominant land use (Map 36). Seven major regions of land use have been found in the Missoula CBD. These are

Landuse Regions of Missoula CBD



Rina Ghose

Map 36

Residential, Manufacturing (which has been subdivided into two categories, type A and type B)⁴² Trade (which in the Missoula CBD is entirely made up of different types of retail trade), Services, Communication, and Cultural, Entertainment and Recreational land use.

A study of the map showing the different regions of land use in the CBD reveals that Services have become the dominant one (Map 36). There are three separate areas involved in the Service activity, two smaller ones lying towards the fringes, a large one extending throughout the central part of the CBD. Retail Trade, one of the most popular land uses of CBDs in America, is found to occupy a secondary position in Missoula's CBD. It contains five medium- to small-sized areas. Manufacturing, types A and B, occur in four small isolated areas and do not give rise to any major regions. Residential land use is seen to be an important one at the fringes of the CBD, and three areas having this land use can be found. The residential areas include hotels as well as group quarters and apartments and houses. Cultural, Recreational, and Entertainment activities are found in three small areas and one large one. The area lying to the south of the CBD forms a large region

⁴² Type A activity includes manufacturing of apparel and other finished products made from fabrics, leather, and similar materials, and printing, publishing and allied industries. Type B activity includes professional, scientific and control instruments, photographic and optical goods and other manufacturing activities.

of Cultural, Recreational, and Entertainment land use, a concentration caused by the presence of adjacent riverside parks. As has been said before, although the Transportation and Communication land use has been ignored in general due to the ubiquitous presence of parking facilities in the CBD, one area has been kept in consideration. This area contains the offices of Mountain Bell, a major telephone company, and was considered to be a definite region of Transportation and Communication land use that needed to be defined.

Analysis of the regions of land use. Retailing is often considered to be the traditional downtown activity.

According to Hartshorn,

as recently as the immediate post-World War II era, downtown was synonymous with retailing, and it was essentially the only place one could find specialty shops or department stores.⁴³

This generalization is no longer accurate in the case of many cities, where retailing has become decentralized. In the case of the Missoula CBD, the retailing function is now secondary to the service function. The retailing activity is concentrated around the major streets like Higgins Avenue, Front Street, Main Street, and Broadway and is found in five separate geographical areas. The first area is on the southwestern corner of the CBD. It shows a small zone of retailing activity towards the western fringe

⁴³ Hartshorn, Interpreting the City, 338.

of the CBD. The second area starts at the western part of the CBD along the Broadway, continues through Main and extends up to the intersection of Front and Higgins. It is an extensive area, with pockets of manufacturing, residential, cultural and recreational activities in between. The dominance of eating and drinking establishments in this area defines this region, along with the number of retail stores that are found around here. The next two areas are found along Higgins Avenue, where a large number of stores retailing apparel and general merchandise occur. The last area occurs at the fringe in block S, which contains retail trade of furniture, home furnishings, etc. (See Map 4 for block names.)

In general, the retail trade zones have developed around the major streets of the CBD, namely Higgins, Front, and Main, along which pedestrian and vehicular traffic volumes are the highest. Locations along these streets have naturally helped the retailing activities to attract more customers.

The decline of retailing activity in Missoula's CBD can be attributed to the fact that retail trade has been greatly decentralized. Southgate Mall, the largest shopping mall in Missoula, is located far away from the CBD. This mall contains a large number of shops selling clothing and accessories, books, electronics, toys, and various specialized items. A number of retail chain stores are

located in this mall, such as Hennessy's, Sears, J.C. Penney, etc., some of which are relatively recent emigrants from the CBD. Other large retail stores, such as K-Mart, Shopko and Best, are also located away from the downtown. New arrivals, such as Wal-Mart and Target, will also be located far away from the downtown.

The reason for the decentralization of Missoula's retail trade can be partially attributed to the shifting focus of the town itself. The CBD of Missoula is located on the north of the Clark Fork River. This is in accordance with the fact that in the past the focus of the city was on the north side of the river. Since then, this focus has shifted to the south side of the river, where the city has grown considerably and has spread farther and farther away from the downtown area. In order to benefit from the spread of population to the south, a large number of retailing activities have been located away from the downtown. Southgate Mall, Shopko, K-Mart, Best and Wal-Mart are such examples.

Missoula's downtown is perceived by the public to be an inconvenient place to shop, it being the location of many offices and having limited parking space. This public impression has also discouraged the growth of retailing in the CBD. Besides, the CBD is marked by the unavailability of large plots of land at affordable prices where new development could take place. Many of the new retailing

stores mentioned above are characterized by large buildings with extensive adjacent private parking lots. It is quite possible that the lack of large acreage of affordable land in the CBD has encouraged these stores to move away. The CBD now contains only one department store, the Bon Marche, located on Higgins Avenue. The rest of the retailing activity of the CBD consists mainly of expensive clothing and accessories shops, jewelry shops and some specialty shops.

Not surprisingly, service activity has replaced the retail activity in the Missoula CBD as the most dominant land use. This is in accordance with Homer Hoyt's theories, which stress the point that office functions are replacing retail functions in the downtowns of large cities.⁴⁴ Truman Hartshorn is also of the opinion that "the growth of the CBD office industry in the post-World War II era offset retail declines." He goes on to state that "offices [are] clustered in the CBD to take advantage of the accessibility of the downtown area for large concentration of workers."⁴⁵ The Missoula CBD supports Hartshorn's claim, for it contains a large service region which consists of many offices belonging to different types of services that are mostly white collar in nature. Particularly dominant in the Missoula CBD are the different financial

⁴⁴ Murphy, The American City, 297.

⁴⁵ Hartshorn, Interpreting the City, 342.

services (banks, savings and loans, credit unions, investment and insurance offices, etc.), professional services (engineering and architectural firms, accounting firms, legal firms, medical service), and several types of governmental services. The reason for the growth of services in the downtown could be the availability of office space, the accessibility of the downtown to office workers, and the prestige of being located in the downtown. Service activity is found in three separate geographical areas: one large, one medium, and one small in size. The first lies in the western part of the CBD. It contains mostly repair stores. The second area starts at the northwest part and extends throughout the central part of the CBD. It is the largest service area in the CBD, containing mainly professional services, financial services and governmental services. The third service area lies along the northeastern fringe blocks, covering blocks B and E. This area has educational and personal services in the form of the Missoula County Extension office and a laundry respectively.

The residential region in the CBD consists of hotels, motels and apartment units. A few membership lodgings are also found in the CBD and are included within the residential category. The residential region occurs mainly in the fringe blocks of CBD, where land prices are less expensive and where the adjoining blocks are also sometimes

residential in nature. In the CBD, there are three separate areas of residential land use. The first area lies at the southeastern edge of the CBD in the block V. It contains household units and the hotel Holiday Inn. The next area lies at the western corner of the CBD, predominantly in the blocks J and T. It contains motels and the Clark Fork Manor, a retirement home. The third area lies at the north western corner in block A. It has mostly household units. The household units in the CBD are found mostly in the upper floors of buildings.

In the case of Missoula's CBD, the residential function does not appear to be highly important. However, in larger cities, residential land use, particularly hotels and motels, tend to play a more important role in the CBDs. In Hartshorn's opinion, "the hotel function became a growth industry in the downtown area in the past 25 years."⁴⁶ The hotels not only provide residence to travellers, but also provide a place to hold conferences and conventions. In Missoula's CBD, the Holiday Inn is the only major hotel that attracts the business market for large-scale conventions and conferences; but there are smaller hotels and motels within the CBD, as well as various membership lodgings, which also provide some of these services. There are other major hotels a few blocks away from the CBD which provide the same functions and often serve the downtown

⁴⁶ Ibid, 347.

clientele as well.

Cultural, entertainment, and recreational activities form the fourth important regional type. It is found in three geographically separate areas. The first area lies along the intersection of Front and Ryman, extending from block P to Q. The next area lies in the eastern half of block I. Both of these areas contain different cultural centers, such as art museums and art galleries. It is interesting to note that the art museum is located in a fringe block, block I, since it does not require high accessibility from the pedestrian traffic. The art galleries are located along Front Street and near Higgins, where they enjoy a high degree of accessibility to customers. Other areas belonging to the Cultural, Entertainment and Recreational activities are found in East Front in block V and in the riverfront area. The one in block V contains a theater and a dance school. But, the important area belonging to this category lies in the southern blocks of the CBD, where the parks bordering the riverfront are found. This is a flood plain area which is being developed as recreational area, and is the site of the Missoula Riverfront Project. This area also includes the Wilma Theater.

As stated in a previous chapter, the Missoula CBD does not provide major cultural or entertainment functions. In the case of large cities, downtowns have often proved to be

a popular location for sports arenas, museums, theaters, musical entertainment pavilions, etc.⁴⁷ In Missoula, this is found on a much smaller scale in the form of a movie hall, a theater, an art museum and several art galleries. Since Missoula is a town with strong interests in outdoor recreational activities, a large amount of land in the CBD bordering the river has been devoted to the creation of parks.

The manufacturing regions, both A and B, are marked by individual establishments involved in particular manufacturing activity and are found in five small separate areas. It is interesting to note that of these areas, the ones requiring large amounts of space are located towards the fringes of the CBD. This has happened in the case of the areas located in blocks K and A, which contain a large apparel manufacturing store and a printing and publishing store, respectively. The other manufacturing stores are smaller in size and could locate themselves around Higgins.

The single area belonging to communication activity in block N occurs as a result of the location of the Mountain Bell Telephone Company.

Conclusion. The study of the functional regions within the CBD provides an opportunity for urban geographers and town planners to analyze and predict the trend in future

⁴⁷ Ibid, 350.

functional growth of the CBD. It is clear that the Missoula CBD has already established itself as being primarily service oriented. Retailing activity has decentralized and has spread out of the CBD to the south side of the town. Other functions exist in the CBD, but they play a minor role.

CHAPTER V

CONCLUSION

This thesis was an effort to present a methodology for regionalizing the land uses of the CBD. The methodology succeeded in depicting the regions of land uses in the Missoula CBD and showed that the approach would work in the case of medium to small-sized cities. The most difficult part of the method proved to be surveying land uses. The job would become much easier if that data were already gathered.

It is not known whether the methodology would work in case of larger cities, although the possibility exists that it may actually work better, since large cities generally display stronger tendencies toward regionalism within their CBDs than do small ones. Further research is needed to know the answer to that question. Future studies can also be conducted regarding the possibility of creating subregions based on the second and possibly even the third digit levels of Standard Land Use Coding Manual. This would produce regions based on very specific types of land use activities.

The Missoula CBD itself proved to be an interesting study area. The study reveals that the major regional activity within the CBD is services rather than retail trade. It is likely that this expresses a relatively new relationship which has resulted from the decentralization of

retail trade. The extent of the different functional areas within the CBD also came as a surprise.

For urban geographers, this thesis provides a methodology that seems to have good prospects for being successful in creating regions of a CBD. Apart from that, the regions of land use that have been found should provide valuable information to local geographers and planners. In addition, the thesis also provides information on the concentration of each land use activity in the Missoula CBD.

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